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Ministry
of the
Environment

Canada Ontario Agreement on Great Lakes Water Quality

Ontario

CANADA-ONTARIO
GREAT LAKES SURVEILLANCE PROGRAMS
1981/82



Prepared by the Surveillance Committee
for the Review Board

Canada-Ontario Agreement on Great Lakes Water Quality

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CANADA/ONTARIO
SURVEILLANCE AND RELATED
RESEARCH PROJECTS
1981/82

PREPARED BY THE SURVEILLANCE COMMITTEE
FOR THE REVIEW BOARD, CANADA/ONTARIO AGREEMENT

SURVEILLANCE COMMITTEE

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Mr. F.C. Elder, Department of the Environment
Dr. H. Shear, Department of Fisheries and Oceans

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* Replaced by Mr. F.C. Fleischer, May 1981

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INTRODUCTION

When the first Canada/U.S. Agreement on Great Lakes Water Quality was signed in 1972, it established a set of principles which would guide the two countries in the task of preserving and enhancing the water quality of the Great Lakes. The most important of these included:

- (a) the development of water quality objectives to be met in the Lakes;
- (b) the commitment to undertake all reasonable and practicable control programs; and
- (c) the institution of a surveillance and monitoring program which would assess compliance with the objectives, assess the effectiveness of implemented control programs and detect the emergence of new problems.

When the revised Agreement was signed in 1978, it preserved these basic principles, but at the same time broadened the scope of the Agreement and introduced an ecosystem approach concept.

Within the federal government, Environment Canada has been assigned the lead responsibility to ensure that the work required by the Agreement is undertaken. Although much of this work can be undertaken directly by the federal government, a great deal is within the jurisdictional responsibility of the province. The Canada-Ontario Agreement Respecting Great Lakes Water Quality and the Canada-Ontario Accord for the Protection and Enhancement of Environmental Quality are the primary mechanisms whereby the two governments commit themselves to various undertakings. Specifically, The Canada-Ontario Agreement (COA) provides the umbrella for sharing 50% of the cost of provincial surveillance efforts on the Great Lakes. This Agreement is presently undergoing revision to make it compatible with the revised (1978) Canada-U.S. Agreement.

This document summarizes the planned 1980/81 surveillance and related research activities of Environment Canada, Fisheries and Oceans Canada, and the Ontario Ministry of the Environment. The combined federal/provincial effort is directed toward meeting the Canadian responsibilities required in (c) above. The projects are conducted within the framework of the Great Lakes International Surveillance Plan (GLISP) developed by the Water Quality Board of the International Joint Commission (IJC), and within the Terms of Reference of the Surveillance Committee of the Canada-Ontario Agreement.

Briefly these state:

"The Federal Government will concentrate its water quality surveillance activities on the open lake waters and connecting channels to :

- (i) determine compliance with IJC (Water Quality Agreement) objectives;
- (ii) delineate problem areas; and
- (iii) determine long term trends."

The Province's activities will include:

"The assessment of water quality in the nearshore waters of the Great Lakes and in the connecting channels including the evaluation of the impact of Ontario based effluents and emissions for the purposes of:

- (i) delineating areas where Agreement objectives are not being met;
- (ii) identifying the source(s) of degradation and possible remedial measures;
- (iii) providing early warning of emerging problems; and
- (iv) evaluating the effectiveness of remedial action."

SECTION 1

ENVIRONMENT CANADA AND FISHERIES AND OCEANS CANADA

SURVEILLANCE PROGRAM AND RELATED RESEARCH ACTIVITIES

1981/82

INLAND WATERS DIRECTORATE/ONTARIO REGION
SURVEILLANCE ACTIVITIES
1981/82

STUDY FORECAST

Date Submitted _____

1. DIVISION: ECS				STUDY NO: WQ-1	
2. FISCAL YEAR: 1981/82		3. STUDY YEAR: 1981/82			
4. PROGRAMME: Great Lakes Basin Water Pollution					
5. PROJECT: Canada/US Offshore Surveillance & Analysis					
6. STUDY NAME: Lake Ontario Open Lake Surveillance					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
		CCIW Surveillance Working Team			
8. <u>Goals: (State what is to be achieved by when)</u>					
Data from all cruises will be analyzed to determine compliance with IJC Water Quality objectives, to describe trends in the open lake and to identify new and developing pollution problems. The information will be used to provide an annual assessment of the water quality conditions of the open waters of Lake Ontario for the IJC Intensive Year Report 1983. A technical report on the past 10 years of Lake Ontario data will be written.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
To fulfill Canada's commitments for surveillance and monitoring under the Canada/US Great Lakes Water Quality Agreement and for the provision of data and assistance to the International Joint Commission..					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
1981 is an intensive study year on Lake Ontario (as outlined in the IJC nine year cycle for the Great Lakes). Eleven lake wide cruises are planned, four of which will be full chemistry cruises. Samples will be collected at a total of 94 stations in the lake for an intensive series of chemical parameters as well as chlorophyll <u>a</u> .					
A ten year Lake Ontario data summary of surveillance parameters will be written in 1981 as a preview to the intensive years. This will include parameter and location descriptions and area weighted mean values for the 17 IJC zones.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: R.E. Kwiatkowski		Telephone: 637-4641		Date:	

STUDY FORECAST

Date Submitted _____

1. DIVISION: ECS				STUDY NO: WQ-2															
2. FISCAL YEAR: 1981/82		3. STUDY YEAR: 1981/82																	
4. PROGRAMME: Great Lakes Basin Water Pollution																			
5. PROJECT: Canada/US Offshore Surveillance & Analysis																			
6. STUDY NAME: Lake Huron Open Lake Surveillance																			
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;">7. <u>Division/Unit/Group:</u></div> <div style="width: 40%;"> <u>Study Team:</u> CCIW Surveillance Working Team (D. Warry, R.Kwiatkowski, M.Morgan) </div> <div style="width: 30%;"><u>Notes:</u></div> </div>																			
8. <u>Goals: (State what is to be achieved by when)</u> Data from the six cruises conducted on Lake Huron in 1980 will be analyzed to determine compliance with IJC Water Quality Objectives, to describe trends in the open lake and to identify new and developing pollution problems. The information will be used to provide an assessment of the water quality conditions of the open waters of Lake Huron for the IJC Annual Report, 1981.																			
9. <u>Relevance: (Justify on scientific and/or social grounds)</u> To fulfill Canada's commitments for surveillance and monitoring under the Canada/US Great Lakes Water Quality Agreement and for the provision of data and assistance to the International Joint Commission.																			
10. <u>Work Outline & Description: (Outline steps to goals)</u> Data from six cruises conducted on Lake Huron will be analysed. A total of 71 stations in Lake Huron, 44 in Georgian Bay and 22 in the North Channel were sampled for nutrients, major ions and chlorophyll <u>a</u> . A report on this intensive effort is due in 1981 for the IJC.																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 15%; padding: 5px; vertical-align: top;">11. CCIW Branch Budget Summary:</td> <td colspan="2" style="padding: 5px;">Manpower</td> <td colspan="2" style="padding: 5px;">Other O&M</td> <td rowspan="3" style="width: 15%; padding: 5px; vertical-align: top;">Capital (\$000)</td> </tr> <tr> <td style="padding: 5px;">P.MY</td> <td style="padding: 5px;">T. MY</td> <td style="padding: 5px;">Contracts (\$000)</td> <td style="padding: 5px;">Ops. (\$000)</td> </tr> <tr> <td style="height: 30px;"></td> <td></td> <td></td> <td></td> </tr> </table>						11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)				
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)														
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)															
12. Study Leader: R.E. Kwiatkowski Telephone: 637-4641 Date:																			

STUDY FORECAST

Date Submitted _____

1. DIVISION: ECS		STUDY NO: WQ-3
2. FISCAL YEAR: 1981/82	3. STUDY YEAR: 1981/82	
4. PROGRAMME: Great Lakes Basin Water Pollution		
5. PROJECT: Surveillance and Monitoring (NWRI)		
6. STUDY NAME: Great Lake Surveillance		

7. <u>Division/Unit/Group:</u>	<u>Study Team:</u>	<u>Notes:</u>
ECS	Dr. A. El-Shaarawi (NWRI)	
WQB-Surveys & Monitoring	R.E. Kwiatkowski (WQB)	

8. Goals: (State what is to be achieved by when)
 Development of a strategy for future data collection with respect to Surveillance. An optimum sampling strategy for Lake Erie for various parameters will be addressed. Optimum being defined as number of stations and the frequency of sampling. Analyses done will be applicable for all lakes.

9. Relevance: (Justify on scientific and/or social grounds)
 A comprehensive and integrated statistical analysis of all the collected data on Lake Erie will be performed to ensure the utilization of all the information available from the programme.

10. Work Outline & Description: (Outline steps to goals)
 Surveillance data from Lake Erie will be used for:

- examining the changes in the quality of water (trend-in-time analysis)
- examining the spatial variability and isolating regions in the Great Lakes with low quality of water
- developing empirical models and studying the association between different limnological variables.

11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	

12. Study Leader: Dr. A. El-Shaarawi Telephone: 637-4584 Date:

STUDY FORECAST

Date Submitted

1. DIVISION: ECS				STUDY NO:	
2. FISCAL YEAR: 1981/82		3. STUDY YEAR: 1981/82		WQ-4	
4. PROGRAMME: Great Lakes Basin Water Pollution					
5. PROJECT: Canada/US Offshore Surveillance & Analysis					
6. STUDY NAME: Lake Ontario Contaminants					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
		CCIW Surveillance Team			
8. <u>Goals: (State what is to be achieved by when)</u>					
Seven stations on Lake Ontario will be sampled for organics in water and in suspended sediment. The stations and timing of sampling coincide with the biological sampling (contaminates in fish and plankton) presently being done.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
The information on organics in the water and suspended sediments is needed if meaningful values for bio-accumulation for a variety of organics are to be generated. No baseline contaminant data for Lake Ontario exists.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
Seven stations in Lake Ontario will be sampled on one cruise in August (to coincide with fish and plankton sampling done by FOC) Water samples will be collected using the newly developed APLE sampler which incorporates a liquid-liquid extraction of 200 litres of sample.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: R.E. Kwiatkowski Telephone: 637-4641 Date:					

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch, IWD, ECS				STUDY NO: WQ-5 A	
2. FISCAL YEAR:		3. STUDY YEAR: 1981-82			
4. PROGRAMME: Great Lakes Basin Water Pollution					
5. PROJECT: Canada/U.S. Offshore Surveillance & Analysis					
6. STUDY NAME: Lake Ontario Open Lake Surveillance: Trace Metals.					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
		M. Morgan			
8. <u>Goals: (State what is to be achieved by when)</u>					
A report summarizing the results of three trace metal cruises conducted in 1979 to be completed and submitted for publication by July 1981.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
The report will fulfill part of the Canadian commitment to the Canada/U.S. Agreement on Great Lakes Water Quality.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
1st Draft has been written.					
Changes, rewrites, further data analysis have yet to be done before complete.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: M. Morgan		Telephone: 637-4641		Date:	

STUDY FORECAST

Date Submitted _____

1. DIVISION:	Water Quality Branch, Ontario Region		STUDY NO: WQ-6	
2. FISCAL YEAR:	1981	3. STUDY YEAR:		1981-82
4. PROGRAMME:	Canada/U.S. & Interprovincial Waters			
5. PROJECT:	Canada/U.S. Offshore Surveillance Analysis			
6. STUDY NAME:	Atmospheric loadings Precipitation Chemistry Network			

7. <u>Division/Unit/Group:</u>	<u>Study Team:</u>	<u>Notes:</u>			
Monitoring & Surveys	C.H. Chan L.H. Perkins N.D. Warry				
8. <u>Goals: (State what is to be achieved by when)</u>					
To provide long term records of the chemical composition of atmospheric deposition within the Great Lakes Basin and to estimate material loading to the Great Lakes.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
To fulfill Canada's surveillance and monitoring activities on atmospheric inputs as outlined in the CAN/U.S. Agreement on Great Lakes Water Quality 1978.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
Monthly integrated samples of wet and dry deposition will be collected at 16 stations along the Canadian shore. These samples will be analysed for nutrients, dissolved major ions and heavy metals. Monthly material loadings to the Great Lakes will be estimated from these measurements. Network operation will be continually updated by constant evaluation and review of past data.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P. MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: C.H. Chan Telephone: 637-4641 Date:					

STUDY FORECAST

Date Submitted _____

1. DIVISION: IWD/WQB				STUDY NO: WQ-7	
2. FISCAL YEAR: 1980-81		3. STUDY YEAR: 1981-82			
4. PROGRAMME: Canada/U.S. & Interprovincial Waters					
5. PROJECT: Can/U.S. Offshore Surveillance Analysis					
6. STUDY NAME: Organics in Atmospheric Deposition					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
WQB		C.H. Chan L.H. Perkins			
8. <u>Goals: (State what is to be achieved by when)</u>					
-to provide a qualitative analysis on the presence of organic contaminants in contaminants in atmospheric deposition within the Great Lakes Basin.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
IJC Science Advisory Board has identified atmospheric deposition of organic contaminants as a significant input to the Great Lakes which are very susceptible to contamination from toxic chemicals.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
This study will be an extension of the existing precipitation network. Additional samplers will be installed at three selected sites to collect samples for organic analysis. Samples will be collected on a weekly basis and monthly composited samples will be analysed for persistent organics.					
Scanning of "new" or previously unidentified chemicals will be performed on a quarterly basis whenever possible.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: C.H. Chan		Telephone: 637-4641		Date:	

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch, Ontario Region		STUDY NO: WQ-8 1
2. FISCAL YEAR: 1981	3. STUDY YEAR: 1981/82	
4. PROGRAMME: Great Lakes Basin Water Pollution		
5. PROJECT: Canada/U.S. Offshore Surveillance and Analysis		
6. STUDY NAME: Support to NEMP Technical Committee		

7. <u>Division/Unit/Group:</u>	<u>Study Team:</u>	<u>Notes:</u>
Monitoring & Surveys Section	C.H. Chan L.H. Perkins	

8. Goals: (State what is to be achieved by when)

To provide a forum for the exchange of ideas and information between the federal and provincial government and private industries.

9. Relevance: (Justify on scientific and/or social grounds)

Relates to precipitation data acquisition and provision of information and assistance to other agencies.

10. Work Outline & Description: (Outline steps to goals)

The requirement is to attend monthly meetings of the NEMP Technical Committee, comment on reports and provide a forum between federal, provincial and private agencies involved in monitoring the environmental air quality near Nanticoke, Ontario.

11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	

12. Study Leader: C.H. Chan Telephone: 637-4641 Date: _____

Want project forecast from Ottawa)

STUDY FORECAST

Date Submitted _____

1. DIVISION: WQB-O.R.				STUDY NO: WQ-9 A	
2. FISCAL YEAR: 1981		3. STUDY YEAR: 1981/82			
4. PROGRAMME:					
5. PROJECT: Organic Compounds in Precipitation					
6. STUDY NAME: Support to CANSOC and CANSAP					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
Monitoring & Surveys Water Quality Branch		C.H. Chan L.H. Perkins			
8. <u>Goals: (State what is to be achieved by when)</u>					
To provide field and laboratory assistance to the collection of precipitation samples across Canada for analysing organic contaminants. No project forecast from Ottawa, therefore this is an estimate.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
Long range atmospheric transport of man-made organic contaminants is the most likely mode of transport to explain the presence of organic contaminants in remote and uninhabited area.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
The work involved in the preparation and processing of samples and sample containers, data logging and the chemical analysis of persistent organic contaminants.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: C.H. Chan		Telephone: 637-4641		Date:	

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch, Ont. Region				STUDY NO: WQ-10	
2. FISCAL YEAR: 1981		3. STUDY YEAR: 81/82			
4. PROGRAMME: Long Range Transport of Atmospheric Pollutants					
5. PROJECT: Evaluation of an Organic Precipitation Sampler					
6. STUDY NAME: Organic Precipitation Sampler*					
7. <u>Division/Unit/Group:</u> WQB		<u>Study Team:</u> C.H. Chan L.H. Perkins		<u>Notes:</u>	
8. <u>Goals: (State what is to be achieved by when)</u> - to evaluate an organic precipitation sampler					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u> An improved collection technique is essential in the qualitative and quantitative identification of organic deposition in the Great Lakes Basin.					
10. <u>Work Outline & Description: (Outline steps to goals)</u> Experiments will be carried out both in the laboratory and in the field to evaluate resin absorption technique in "trapping" of organic contaminants from rain samples. A field station will be established to evaluate the field performances of the NWRI organic precipitation sampler. * NWRI is willing to provide funding for this project.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader:		Telephone:		Date:	

STUDY FORECAST

Date Submitted _____

1. DIVISION: Monitoring & Surveys				STUDY NO: WQ-28	
2. FISCAL YEAR: '1981-82		3. STUDY YEAR: 81-82			
4. PROGRAMME: Can-U.S. and Interprovincial Waters					
5. PROJECT: Can-U.S. Offshore Surveillance and Analysis					
6. STUDY NAME: Organic Sampling in Atmospheric Precipitation					
7. <u>Division/Unit/Group:</u> Monitoring & Surveys WQB		<u>Study Team:</u> C.H. Chan Term Technician J. Coburn		<u>Notes:</u>	
8. <u>Goals: (State what is to be achieved by when)</u> To develop a sampling procedure for collecting rain samples for organic analysis.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u> Improved sampling technique will improve data quality which is essential in the quantitative and qualitative identification of organic deposition in the Great Lakes Basin. Identified as necessary in R.A.B. submission to W.Q. Board.					
10. <u>Work Outline & Description: (Outline steps to goals)</u> Experiments will be conducted both in the laboratory and in the field to examine means to ; 1) minimize re-volatilization of trace organics once the rain sample is in the sampler, 2) to determine the optimal sampling period for sample stability and, 3) to convert existing precipitation samplers to collect organic samples with minimum modifications.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: _____ Telephone: _____ Date: _____					

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch, Ontario Region		STUDY NO: WQ-11
2. FISCAL YEAR: 1981-82	3. STUDY YEAR: 81-82	
4. PROGRAMME: Great Lakes Basin Water Pollution		
5. PROJECT: CAN/U.S. Interconnecting Surveillance & Analysis		
6. STUDY NAME: Niagara River, Daily Water Quality Monitoring		

7. Division/Unit/Group: Monitoring & Surveys Section
Water Quality Branch
- Study Team: K.W. Kuntz
M.A. Morgan
- Notes:
8. Goals: (State what is to be achieved by when)
To establish long term water quality records for trend evaluation and to provide annual material loads from the Niagara River into Lake Ontario.
9. Relevance: (Justify on scientific and/or social grounds)
To fulfill Canada's surveillance and monitoring requirements on the Interconnecting Channels as outlined in Annex 11 of the Can/U.S. Agreement of Great Lakes Water Quality - 1978.
10. Work Outline & Description: (Outline steps to goals)
This is the sixth year of a continuing project. Daily water samples are collected by an automatic sampler at Niagara on the Lake. Samples are returned to Burlington weekly for analysis.
Analysis:
Daily- pH, conductivity, TKN, NO₃, NH₃, TP.
Weekly- Major Ions, Total Metals, As, CN, Se, Hg.
Monthly- Large volume water extract for organics (PCB's, OC's, chlorobenzenes, AH's phthalate).

11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: K.W. Kuntz Telephone: 637-4641 Date:					

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch, Ontario Region				STUDY NO: WQ-12	
2. FISCAL YEAR: 1981-82		3. STUDY YEAR: 81-82			
4. PROGRAMME: Great Lakes Basin Water Pollution					
5. PROJECT: Can/US Interconnecting Channels Surveillance & Analysis					
6. STUDY NAME: Niagara River Toxic Contaminants Sources Survey					
7. <u>Division/Unit/Group:</u> Monitoring & Surveys Section Water Quality Branch		<u>Study Team:</u> K.W. Kuntz D. Warry		<u>Notes:</u>	
8. <u>Goals: (State what is to be achieved by when)</u> To more accurately define sources and violations to IJC specific water quality objectives in the Niagara River					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u> To fulfill Canada's surveillance and monitoring requirements on the Interconnecting Channels as outlined in Annex II of the Can/US Agreement on Great Lakes Water Quality-1978, in particular to more accurately define sources of toxic contaminants in the Niagara River and violations of IJC specific objectives.					
10. <u>Work Outline & Description: (Outline steps to goals)</u> Large volume water samples, and bottom sediment samples will be collected in both Upper and Lower Niagara River at approximately 30 locations, suspended sediment samples at approximately 6 locations, Analysis: PCB's OC's, pAH's, chlorobenzenes, phthalates, trace metals (on sediments) dioxins, GC-MS scan for new compounds.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: K. Kuntz Telephone: 637-4641 Date: Jan 16/81					

1. DIVISION: Water Quality Branch, Ontario Region		STUDY NO: WQ - 13
2. FISCAL YEAR: 1981-82	3. STUDY YEAR: 81/82	
4. PROGRAMME: Great Lakes Basin Water Pollution		
5. PROJECT: Can/US Interconnecting Channels Surveillance & Analysis		
6. STUDY NAME: Niagara River, Suspended Sediments		

7. <u>Division/Unit/Group:</u>	<u>Study Team:</u>	<u>Notes:</u>
Monitoring & Surveys Section Water Quality Branch	K.W. Kuntz M. Morgan	

8. Goals: (State what is to be achieved by when)

To quantify loadings of PCB's and chlorobenzenes to Lake Ontario via the Niagara River, to identify new and developing problems, to identify violations of IJC specific objectives for water quality and to establish a sediment sample bank for future analysis of unforeseen problems.

9. Relevance: (Justify on scientific and/or social grounds)

To support of the International Surveillance Plan to identify concentration trends of persistent toxic substances in sediments of the Great Lakes Basin as outlined in Annex 12 of the Can/U.S. Agreement on Great Lakes Water Quality 1978.

10. Work Outline & Description: (Outline steps to goals)

Suspended sediment samples will be collected on a weekly basis at Niagara on the Lake. Sampling time will be increased to 24 hours so that enough material is collected for analysis and the sediment bank. Weekly samples will be composited for bi-weekly analysis of PCB's, OC's, chlorobenzenes, phthalates, and PAH's. For identification of new and developing problems 10g from each weekly sample will be composited quarterly for dioxin and a GC-MS scan. To identify violations of IJC specific objectives for water, a 4L water sample will be collected bi-weekly. Remaining material will be deposited in the Sediment Bank
Report written on 1980-81 data when available

11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: K. Kuntz Telephone: 637-4641 Date: Jan 16/81					

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality Branch Ontario Region				STUDY NO: WQ 14	
2. FISCAL YEAR: 1981-82		3. STUDY YEAR: 81-82			
4. PROGRAMME: Great Lakes Basin Water Pollution					
5. PROJECT: Can/US Interconnecting Channels Surveillance & Analysis					
6. STUDY NAME: Niagara River - Detailed Survey of Contaminants at Niagara on the Lake					
7. <u>Division/Unit/Group:</u> Water Quality		<u>Study Team:</u> Ken Kuntz D. Warry		<u>Notes:</u>	
8. <u>Goals: (State what is to be achieved by when)</u> To determine short term frequency of non-compliance with IJC specific objectives for PCB's and chlorobenzenes in suspended sediments and to more accurately define occurrences and variations of other as yet unanalyzed for organic compounds.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u> In support of the International Surveillance plan, to identify concentration trends of persistent substances in water and suspended sediments of the Great Lakes System as outlined in Annex 12 of the Can/US Agreement on Great Lakes Water Quality 1978.					
10. <u>Work Outline & Description: (Outline steps to goals)</u> Suspended sediment samples were collected continuously for a 10 day period in November 1980. Routine analysis (ie PCB & OC's, pAH's, phthalates, and chlorobenzenes as well as Dioxin (on 2 samples), GC-MS scan as well as other non-standard analysis. In addition extractable metals analysis, ie Hg, Pb, etc will be done on these samples. A report will be written on this data when it is available. Remaining samples (if any) will be kept for future compounds of interest and analysis completed when methods become available.					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: K. Kuntz Telephone: 637-4641 Date: Jan 16/8					

STUDY FORECAST

Date Submitted _____

1. DIVISION: Water Quality		STUDY NO: WQ-15
2. FISCAL YEAR: 1981-1982	3. STUDY YEAR: 81-82	
4. PROGRAMME: Great Lakes Basin Water Pollution		
5. PROJECT: CAN/US Interconnecting Channels Surveillance & Analysis		
6. STUDY NAME: St. Lawrence River, Daily Water Quality Monitoring		

7. Division/Unit/Group: Study Team: Notes:

Monitoring & Surveys Section
Water Quality Branch

K.W. Kuntz
M. Morgan

8. Goals: (State what is to be achieved by when)

To establish long term water quality records for trend evaluation and to provide annual material exit loads of the Lake Ontario outflow.

9. Relevance: (Justify on scientific and/or social grounds)

To fulfill Canada's surveillance and monitoring requirements on the Interconnecting Channels as outlined in Annex II of the Can/US Agreement on Great Lakes Water Quality-1978.

10. Work Outline & Description: (Outline steps to goals)

This is the fifth year of a continuing project. Through a personal service contract, daily samples are collected by an automatic sampler at Wolfe Island. Water samples are sent back to Burlington for chemical analysis. This year, a monthly suspended sediment sampling program will be initiated. Suspended sediments (using centrifuge) and large volume water sample will be sampled at the Wolfe Island location for PCB's, OC's, PAH's, chlorobenzenes, phthalates on a monthly basis. Also a GC-MS scan and dioxins (on sediments) will be run on 4 month composites and any remaining materials will be banked for future analysis.

11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	

12. Study Leader: Ken Kuntz

Telephone: 637-4641

Date:

STUDY FORECAST

Date Submitted _____

1. DIVISION: WATER QUALITY BRANCH: ANALYTICAL SERVICES				STUDY NO: WQ-16	
2. FISCAL YEAR: 1981-82		3. STUDY YEAR: ONGOING			
4. PROGRAMME: CANADA-U.S. AND INTERPROVINCIAL WATERS					
5. PROJECT: LABORATORY OPERATIONS					
6. STUDY NAME: SAMPLE ANALYSIS AND ANALYTICAL SUPPORT					
7. <u>Division/Unit/Group:</u>		<u>Study Team:</u>		<u>Notes:</u>	
Analytical Services Section		Chief, Water Quality Branch Head, Analytical Services Section Professional & technical support staff			
8. <u>Goals: (State what is to be achieved by when)</u>					
Provision of adequate analytical support services and maintenance of analytical capability to do chemical and physical analyses on a wide variety of water, wastewater, sediment, fish and other water-related substances in support of projects and studies related to environmental management and protection and related research.					
9. <u>Relevance: (Justify on scientific and/or social grounds)</u>					
Relates to EMS' Mandate for the operation of analytical labs and the acquisition of physical and chemical data for environmental management and research purposes. eg. The Canada Water Act; Canada/U.S. Water Quality Agreement, Fisheries Act, Environmental Contaminants Act, the Federal Policy Statement on Inland Waters.					
10. <u>Work Outline & Description: (Outline steps to goals)</u>					
<ul style="list-style-type: none"> - Continuation of laboratory operation activities at CCIW to measure a wide range of chemical and physical parameters. - Operation of laboratories on board CCIW research vessels to analyze Great Lake water samples for a variety of constituents. - Setting up and operation of field laboratories to provide analytical support to a number of field projects. 					
11. CCIW Branch Budget Summary:	Manpower		Other O&M		Capital (\$000)
	P.MY	T. MY	Contracts (\$000)	Ops. (\$000)	
12. Study Leader: Head, Analytical Services Section Telephone: 637-4315 Date: 2/1/81					

NATIONAL WATER RESEARCH INSTITUTE (NWRI)
SURVEILLANCE AND RELATED RESEARCH ACTIVITIES
1981/82

NATIONAL WATER RESEARCH INSTITUTE
ANNUAL STUDY FORECAST

TITLE: Lake Ontario Water Chemistry Atlas		F.Y. 81/82	NO. 424
E.C.S. NATIONAL PROGRAM: 1.7 Water Management Research		DIVISION: Aquatic Ecology	
N.W.R.I. PROJECT: 443 524 Aquatic Ecology		SECTION: Great Lakes	
STUDY TEAM: Leader: Hugh F.H. Dobson Tel. 637-4506 Members:		DATE: January 1981	
KEY WORDS: Lake Ontario, atlas, water chemistry, nutrients			
<p>GOAL: (State what is to be accomplished by when.)</p> <p>As the first part of the anticipated Great Lakes Water Chemistry Atlas, a collection of graphs, tables and text describing nutrient conditions and related factors in Lake Ontario from 1966 to 1980 will be submitted in as complete as possible composition in the time available, using a variety of kinds of plots for a number of key parameters with some attention to giving a balanced overall picture.</p>			
<p>JUSTIFICATION: (State reasons for study, scientific, requests, treaty, etc.)</p> <p>Lake Ontario has been the most intensively observed lake for CCIW, and nutrient management is a vital question for that lake. The lake is important to Canada/U.S. relations expressed in their Agreement, and the lake will be a prominent focus of CCIW research in the next few years.</p>			
<p>WORK PLAN: (List steps to goal.)</p> <p>One month each will be spent describing each of the following conditions:</p> <p>1) Temperature, 2) Secchi depth and chlorophyll, 3) oxygen, 4) phosphorus in three forms, 5) nitrogen in a number of forms, 6) carbon in a number of forms, 7) pH, alkalinity and the carbon dioxide system, 8) major ions, 9) metals, 10) weather at Toronto, 11) currents, 12) biological data.</p>			
N.W.R.I. Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K Other Req'ts:

NATIONAL WATER RESEARCH INSTITUTE

STUDY FORECAST

TITLE: GENERAL PURPOSE THREE DIMENSIONAL GRAPHICS SOFTWARE DEVELOPMENT		FY: 81-82	No. 576
ECS NATIONAL PROGRAM: 1.1 CANADA/U.S. AND INTERPROVINCIAL WATERS		DIVISION: 325 AP & SD	
NWRI PROJECT: 443 SURVEILLANCE IN THE GREAT LAKES		SECTION: Data Management	
STUDY TEAM: Leader: G.S. Beal Tel: 637-4373		DATE: April, 1981	
Members: NWRI scientists and one term position.			
KEY WORDS: Interactive, Computer Graphics.			
GOALS: To expand the application of computer based graphics facilities at CCIW, implementing three dimensional graphics displays for Great Lakes surveillance data evaluation and related research.			
RELEVANCE: The application of three dimensional graphics to review, correct and evaluate environmental data, and to provide for visual display of environmental conditions and dynamically modelled processes will aid the water quality monitoring programs and related research support efforts.			
WORK OUTLINE & DESCRIPTION:			
1. Enhance existing software for the graphic display of spatial and time series Great Lakes surveillance data. Contract out CCRS software systems conversion to CYBER/NORPACK hardware subject to feasibility study and funding approval from LANDS DIRECTORATE.			
2. Develop additional graphics software for data editing applications as related to Great Lake surveillance data.			
3. Develop software for the performance evaluation of dynamic models for Great Lakes surveillance data.			
4. Consult with the scientific community engaged in Great Lakes water quality agreement related activities to develop specific three dimensional displays depicting lake conditions.			
5. Develop general purpose applications software for the production of lake wide and cross sectional displays of surveillance data.			
NWRI Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K
		Other Req'ts:	

NATIONAL WATER RESEARCH INSTITUTE

STUDY FORECAST

TITLE: WATER QUALITY DATA BASE ADMINISTRATION		FY: 81-82	No. 572	
ECS NATIONAL PROGRAM: 1.1 CANADA/U.S. AND INTERPROVINCIAL WATERS		DIVISION: 325 AP & SD		
NWRI PROJECT: 443 SURVEILLANCE IN THE GREAT LAKES		SECTION: Data Management		
STUDY TEAM: Leader: R. Duffield Tel: 637-4324		DATE: April, 1980		
Members: J. Rogalsky, A. Zingaro, W. Nagel, H. Comba				
KEY WORDS: Data Base Administration, Security, Access				
<p><u>GOAL:</u> To provide for the secure administration, integration and operational accessibility to current and historical scientific data acquired in support of the Great Lakes Surveillance program. To facilitate data analysis and interpretation in anticipation of research and reporting requirements.</p> <p><u>RELEVANCE:</u> To formulate new or revised data base structures for relational data sets providing for scientific compatibility, both operational and back-up data security, convenient and economic access, enhanced analytical and display capabilities, ensuring minimum expenditure of resources, to fulfil the desired aims of established programs and to identify and enunciate the implications of various alternatives available to CCIW management.</p> <p><u>WORK OUTLINE & DESCRIPTION:</u></p> <ol style="list-style-type: none"> 1. Maintain DBMS and existing programs, or enhance other file management software systems using new EDP technologies. 2. Apply the System 2K Data Base Management System for various internal data storage/retrieval requirements related to the surveillance program and lakes evaluation research (ie) STORET Data, use of SPSS. 3. Undertake periodic reviews of data collection, data reduction and archival back-up programs to meet departmental objectives and security regulations on an economic and timely basis. 4. Prepare appropriate documented operational or policy proposals and recommendations for management consideration. 5. Prepare documents related to water quality data bases and systems for publication. 6. Participate in special studies aimed at the rationalization of data management practices in relation to departmental plans and initiatives for the establishment of cooperative standardized or compatible data processing services. 7. Participate in meetings or assume delegated responsibility on internal, departmental, and international committees and work groups engaged in the development of plans and policy recommendations in relation to the management of environmental data. 				
NWRI Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K	Other Req'ts:

NATIONAL WATER RESEARCH INSTITUTE

STUDY FORECAST

TITLE: NWRI BRANCH RESEARCH SUPPORT - DATA MANAGEMENT		FY: 81-82	No. 573
ECS NATIONAL PROGRAM: 1.6 WATER MANAGEMENT DATA		DIVISION: 325 AP & SD	
NWRI PROJECT: 500 WATER MANAGEMENT DATA (GENERAL)		SECTION: Data Management	
STUDY TEAM: Leader: H. Comba Tel: 637-4628		DATE: April, 1981	
Members: Head, Data Management and Staff			
KEY WORDS: EDP Support, Design, Programming, Consultation, Training.			
<p>GOALS: To provide professional consultation, scientific manuscript production and systems design services, and computer programming and data processing support required for NWRI Branch research studies and environmental monitoring activities as determined and scheduled from projected support requirements identified in approved study forecasts.</p> <p>RELEVANCE: Provision of professional guidance and direct support for computer based systems development or modification and for scientific manuscript production, data reduction and statistical analysis work is essential to complete NWRI studies approved in the context of departmental programs.</p> <p>WORK OUTLINE & DESCRIPTION: To meet the goals it is necessary to:</p> <ol style="list-style-type: none"> 1. Review and evaluate, schedule, monitor and revise professional programming, clerical and technical resources requested in the research study forecasts for fiscal year 1981/82, and provide scientific manuscript production services. 2. Consult with NWRI scientists regarding study support requirements, data applicability, and valid mathematical procedures. 3. Analyse detailed data processing requirements, synthesize and/or review software systems and develop related computer programs in support of approved research studies. 4. Provide professional consulting services to resolve short term unscheduled programming problems encountered by users of computer facilities in relation to new hardware/software development or systems revisions by user groups. 5. Provide developmental support to approved internal study activities in support of general EDP requirements for NWRI. 6. Evaluate EDP needs and procedures and identify desirable equipment upgrades, conversions, or procedural revisions (ie) migration from PDP 15 to other computer/s. 7. Develop special administrative applications at management direction through approved reassignment of resources. 8. Implement training programs for staff development and users through approved external or contracted in-house courses, and custom materials developed internally in relation to: on-line program design, S2K/TIGS/GRAPHICS: EDP/SOFTWARE FILES/SYSTEMS SECURITY and PROJECT MANAGEMENT. 			
NWRI Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K Other Req'ts:

NATIONAL WATER RESEARCH INSTITUTE

STUDY FORECAST

TITLE: NON-NWRI BRANCH RESEARCH PROGRAMMING SUPPORT		FY: 81-82	No. 574
ECS NATIONAL PROGRAM: 1.6 WATER MANAGEMENT DATA		DIVISION: 325 AP & SD	
NWRI PROJECT: 500 WATER MANAGEMENT DATA (GENERAL)		SECTION: Data Management	
STUDY TEAM: Leader: H. Comba Tel: 637-4628		DATE: April, 1981	
Members: Head, Data Management and Staff			
KEY WORDS: EDP Support, Design, Programming, Consultation, Training			
<p><u>GOALS:</u></p> <p>To provide professional consultation, systems design services, and computer programming and data processing support required for Non-NWRI Branch research studies and environmental monitoring activities required from approved programs, as identified and scheduled from approved study forecasts.</p>			
<p><u>RELEVANCE:</u></p> <p>Provision of professional guidance and direct support for computer based systems development or modification and for special scientific data reduction and statistical analysis tasks is required to in support of approved programs.</p>			
<p><u>WORK OUTLINE & DESCRIPTION:</u></p> <ol style="list-style-type: none"> 1. Review and evaluate, schedule, monitor and revise professional programming, clerical and technical resources requested in study forecasts for fiscal year 1981/82. 2. Consult with scientists regarding study support requirements, data applicability, and valid mathematical procedures. 3. Analyse detailed data processing requirements, synthesize and/or review software systems and develop related computer programs in support of approved studies. 4. Provide professional consulting services to resolve short term unscheduled programming problems encountered by users of computer facilities in relation to new hardware/software development or systems revisions by user groups. 			
NWRI Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K
Other Req'ts:			

NATIONAL WATER RESEARCH INSTITUTE

ANNUAL STUDY FORECAST

TITLE: Computer Services for Surveillance		F.Y. 81/82	No 680	
E.C.S. NATIONAL PROGRAM:	Water Management Research	1.7	DIVISION 326	
N.W.R.I. PROJECT:	Computer Services	500/443	SECTION 9 CCS	
STUDY TEAM: Leader: H.C. Pulley			DATE December 5, 1980	
Tel: 637-4209				
Members: M. Kinder, B. Malseed, U. Hamilton, J. Foley, 1 to be staffed				
KEY WORDS: Computing, plotting, support				
<p>GOAL: Provide centralized computing, plotting and keypunch services to NWRI surveillance program throughout the fiscal year.</p> <p>RELEVANCE: The surveillance program is heavily dependent on the Computer Services Section for EDP support in the areas of data quality control, archiving, reporting and analysis.</p> <p>WORK PLAN: This study involves ongoing research support. The quality of this support will be maintained by:</p> <ol style="list-style-type: none"> 1) providing operating staff for the installation for a minimum of nine hours per working day; 2) analyzing and, if feasible, installing all CYBER 171 software releases within two months of delivery; 3) striving for a minimum monthly up-time for the CYBER 171 of 95% of scheduled production hours. 				
N.W.R.I. Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K	Other Req'ts.

NATIONAL WATER RESEARCH INSTITUTE
ANNUAL STUDY FORECAST

TITLE: Surveillance Design: Advanced Planning for Instrumentation Systems.		F.Y. 81/82	NO. 706
E. C.S. NATIONAL PROGRAM: CODE 1.1 CAN/US and Interprovincial Waters		DIVISION: Hydraulics	
N.W.R.I. PROJECT: ELEMENT 443 Great Lakes Surveillance		SECTION: ESS/ IRD	
STUDY TEAM: Leader: A.S. Watson Tel. 637-4262		DATE: Drafted Sept. 1980	
Members: NWRI scientists doing GLWQA-related research. Participating surveillance staff in WQB, GLBL and NWRI as required.			
KEY WORDS: Surveillance Design. Water Quality Instrumentation.			
<p>GOAL: (State what is to be accomplished by when.)</p> <p>To explore, in CCIW context, a range of perceived or conceptualized opportunities for improved, more-cost-effective, WQ surveillance measurement methods and instrumentation systems. To perform this work interactively and in-tune with CCIW Surveillance Planning Group, and in anticipation of modified future surveillance requirements or re-orientation. (Such as improved temporal coverage; improved spatial coverage; improved wintertime (underice) coverage; reduced ship size or operator PY's; need for selective realtime WQ data; etc.)</p>			
<p>JUSTIFICATION: (State reasons for study, scientific, requests, treaty, etc.)</p> <p>Evidence such as inhouse CCIW opinions; published surveillance statistical analyses (EG. APSD-505); certain new requirements in the 1978 GLWQA; non-continuous CCIW surveillance coverage; and others, suggest that alternative surveillance options (different from traditional CCIW methods) should at least be explored and reviewed in an official, organized context. Additionally, such work would complement, in the hardware/instrumentation domain, NWRI's ongoing, similar, exploratory review work in the software/Surveillance-Data-Management domain. (APSD-572). Suggestions, voiced at times, that improved temporal coverage, or spatial coverage, or underice coverage, might be beneficial, all have major hardware impact. The pro's and con's justify exploratory study and budgetary estimating.</p>			
<p>WORK PLAN: (List steps to goal.)</p> <ul style="list-style-type: none"> - To review existing CCIW surveillance techniques, particularly those with low temporal/spatial capability. To confirm adequacy, or identify inadequacies, in traditional techniques and systems. - To propose to and explore with, the CCIW Surveillance Planning Group, alternative options for more cost/effective hardware or instrumentation methods. - To select specific cases by discussion and consensus within IWD. - To perform and complete technical groundwork and preplanning such as systems-concept-formulation, identification and trade-off analyses of any limiting factors, budgetary estimates, etc. - To place subcontract studies if appropriate and possible. - To seek, obtain and develop a final, well-reasoned, CCIW position as to future hardware implementation. 			
N.W.R.I. Resource Summary:	P/Y:	O&M: \$ K	CAP: \$ K
Other Req'ts:			

20/11/79

NWRI CODE 4706

Form 1

NATIONAL WATER RESEARCH INSTITUTE
ANNUAL STUDY FORECAST

TITLE: Open Lakes Surveillance Support	F.Y. 81-82	NO. 803
E.C.S. NATIONAL PROGRAM: 1.1 Canada/U.S. & InterProv. Waters	DIVISION: Technical Operations	
N.W.R.I. PROJECT: 443 Surveillance Surveys for Great Lakes	SECTION: Ship Survey	
STUDY TEAM: Leader: M.R. Mawhinney Tel. 637-4691 Members: Technical Operations Staff	DATE: June 22, 1981	
KEY WORDS: Technical Field Support		
GOAL: (State what is to be accomplished by when.) To provide a continuing report on long term trend information of water quality and eutrophication parameters in the Great Lakes.		
JUSTIFICATION: (State reasons for study, scientific, requests, treaty, etc.) To provide the input required for the Surveillance Program under the Canada/U.S. Agreement and Water Quality Board Annual Report to the International Joint Commission (IJC).		
WORK PLAN: (List steps to goal.) To provide the support and expertise to carry out the Surveillance Program by: <ol style="list-style-type: none"> 1. Logistics management and co-ordination of the program. 2. Technical support. 3. Writing of cruise plans and reports. 4. Writing of preliminary descriptive reports. 5. Input to the "Surveillance Working Committee". 6. Surveillance support to the Canadian Wildlife Service. 7. Surveillance support to Great Lakes Biolimnology Laboratory. 		
N.W.R.I. Resource Summary:	P/Y:	O&M: \$ K
		CAP: \$ K
		Other Req'ts:

27/10/80

Form 1

CANADIAN WILDLIFE SERVICE
SURVEILLANCE AND RELATED RESEARCH ACTIVITIES
1981/82

81/82 GLWQ CONTAMINANTS PROGRAM PROJECTS CONTINUING INTO 82/83

Please fill out this form and submit to RDG's Office.

Agency: CMS - Ontario Region Project Number: 1305Project Title: Surveillance of Toxic Substances in Great Lakes Wildlife

Relevant Program

Activity: Evaluation and Contaminants

Project Purpose: In the Herring Gull and other wildlife at the top of the aquatic food web to (1) determine temporal and spacial trends in contaminants, (2) discover new contaminants, and (3) identify the gross biological effects of contaminants.

Project Description:(1) Work Accomplished in 81/82(2) Work Intended in 82/83

<u>Funding:</u>		<u>MY</u>	<u>SAL</u>	<u>OM</u>	<u>CAP</u>
<u>81/82</u>	GLWQA	1.0	18.6	45.0	12.0
	'A' BASE	3.0	81.7	77.0	-
	TOTAL	4.0	100.3	122.0	12.0
<u>82/83</u>	GLWQA (requested) (Chemistry)	*1.0	18.6		
	(Biology)	*1.0	18.6	45.0	10.0
	'A' BASE (committed)	3.0	87.0	77.0	-
	TOTAL	5.0	124.2	122.0	10.0

When did this project begin? 1976

No date identified:

When will this project end? Linked to International Surveillance PlanWhat is the expected final output? Support to International Surveillance PlanProject Leader: Dr. D.J. Hallett, Dr. D.V. WeselohProject Manager: T.C. Dauphiné

GREAT LAKES BIOLIMNOLOGY LABORATORY (GLBL)

SURVEILLANCE AND RELATED
RESEARCH ACTIVITIES

1981/82

19 81 - 82

1. KEY WORDS: Benthic Community Structure

PROJECT NO.: 81-FR-BL-005

2. FILING DATE:

PROJECT YEAR:

DURATION: 1 year

3. PROGRAM: Surveillance

4. PROJECT NAME: Community Analysis of Lake Erie Benthos

5. DIVISION, UNIT, GROUP GLBL PROJECT GROUP R. Dermott

6. OBJECTIVE:

1. To complete the sorting, identification and analysis of the previously collected benthic samples collected in Lake Erie, 1978-1979.
2. To complete the data tabulation so that the data for Lake Erie are directly comparable to that from the Upper Great Lakes, to allow detailed statistical analysis.
3. To examine the changes in the Lake Erie benthic community in the western basin, relating the present benthos to that of previous surveys in 1932 and 1962 reported in Carr and Hiltunen 1965, in order to determine if the present status of the bottom fauna indicates improvement of water quality or continuing expansion of the zones of heavy pollution.

RELEVANCE:

To complete the analysis of samples previously collected and the response of the biota to the sediment parameters collected on the cruises. Assessment of how the present water quality influences the benthic fauna.

WORK OUTLINE AND DESCRIPTION:

1. A total of 30 shipex samples were collected from the western end of Lake Erie during October, 1978, with 45 samples collected from western Lake Erie during October, 1979. These samples have been screened and preserved, however, sorting for removal of the invertebrates present, identification, enumeration and biomass determination has yet to be done. With this done the fauna can be analyzed with respect to the concurrently collected sediment data, as well as comparisons made with the upper Great Lakes benthic surveys of 1973 to determine the most significant factors affecting the benthic distribution in the various locations of the Great Lakes.

The 75 samples from western Lake Erie can be related historically to previous surveys done which have shown the expansion of poor conditions since the 1930's in order to determine if the present efforts to improve water quality has had any effect on the benthic fauna.

19 81-82PROJECT NO.: 81-FR-BL-005-

ASPECTS COMPLETED DURING PREVIOUS YEAR:

Sample collection was completed in 1979. Sediment analysis has been completed for a number of parameters which have been shown to determine the distribution of the benthic fauna in the upper Great Lakes.

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

None

COST:

Sorting, identifying and biomass determination must be done according to DSS, outside of GLBL facilities, at an estimation of \$60.00 each sample.

Cost for the 75 samples from western Lake Erie would be:

$$75 \times 60 = \$4,500.$$

7. MAN-YEAR EFFORT (GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

CAS:

8. PROJECT LEADER: Ron Dermott

TELEPHONE: 416 - 637-4702.

1. KEY WORDS Biological surveillance, fish health

PROJECT NO: 81-FR-BL-007

2. FILING DATE: February 27, 1981 PROJECT YEAR: 1981-82

DURATION: Ongoing

3. PROGRAM: G.L.B.L. Surveillance

4. PROJECT NAME: Fish Health Assessment

5. DIVISION, UNIT, GROUP
Surveillance

PROJECT GROUP

V. Cairns, R. Campbell, M. Kier

6. OBJECTIVE:

See Attached

RELEVANCE:

See Attached

WORK OUTLINE AND DESCRIPTION:

See Attached

ASPECTS COMPLETED DURING PREVIOUS YEAR:

See Attached

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

The tagging and recapture program will continue into the Spring of 1982.

7. MAN-YEAR EFFORT(GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

CAS:

8. PROJECT LEADER:

V. W. Cairns

TEL: 637-4203

Objectives:

This project is a continuation of project 007 initiated in April 1980 for the purpose of identifying suitable procedures for detecting environmental stress in Great Lakes fish and evaluating the applicability of these procedures to a biological surveillance program.

Field collections will be completed for the tumour monitoring survey and an intensive study of Hamilton Harbour will be initiated to assess the usefulness of the white sucker (Catostomus commersoni) papilloma as an indicator of environmental deterioration.

Relevance:

The development of suitable test procedures for measuring the response of fish to environmental stress will provide a means of assessing the health of fish from selected areas in the Great Lakes; an early warning of deteriorating environments and an opportunity to link laboratory cause and effect studies with field observations.

Work Outline and Description:

The tumour monitoring survey will be completed with the collection of white suckers (Catostomus commersoni) from 15 sites on the lower Great Lakes. Nine of these sites are repeats to verify observations from the 1980 collections. A mark and recapture program will be initiated in Hamilton Harbour to assess various population characteristics which may be useful indicators of stress. These include growth, fecundity, mortality, year class strength and movement. Histological comparisons of tissues from papillomous and non papillomous fish will continue, to determine if the white sucker papilloma is a useful indicator of stressed environments.

Aspects Completed During the Previous Year:

The tumour monitoring and fish health survey began in April 1980. Tumour incidence has been recorded for at least three fish species from 27 different sites in the lower Great Lakes. Approximately 8,000 fish have been observed and dissected during the survey. Five tumour bearing fish and five normal fish of each species from each site have been preserved for contaminant analyses.

Samples of gill, thyroid, heart, liver, spleen, kidney, gonad and blood have been collected from ten fish of each species from each site and preserved for histological analyses. Opercular bones and scales were collected from at least 30 fish of each species from each site to compare growth in the different locations and to provide size-age regressions for future study. Organs from 30 fish of each species at each site have been weighed to determine the usefulness of organ/somatic indices as indicators of fish health.

- | | | | |
|--------------------------|---|---------------|--------------|
| 1. KEY WORDS | Reproduction, lake trout | PROJECT NO: | 81-FR-BL-008 |
| 2. FILING DATE: | Feb. 27, 1981 | PROJECT YEAR: | 1981-1982 |
| 3. PROGRAM: | Surveillance | DURATION: | 1 year |
| 4. PROJECT NAME: | Reproduction in Great Lakes Lake Trout | | |
| 5. DIVISION, UNIT, GROUP | PROJECT GROUP V. Cairns, S. Ruby, M. Keir | | |
| 6. OBJECTIVE: | To determine the implications of gonad anomalies on the reproductive potential of Great Lakes lake trout. | | |

RELEVANCE:

See attached.

WORK OUTLINE AND DESCRIPTION: The 1980 work will be confirmed histologically on a larger sample size of 30 constricted and 30 non constricted testes. Histological studies of reproductive impairment will be confirmed with sperm counts and physiological assessment of reproductive potential. Both the histology and physiology will be done under contract.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

See attached

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

Unknown

7. MAN-YEAR EFFORT (GLBL) THIS FORECAST PERIOD	PROF:	TECH:	CAS:
8. PROJECT LEADER: V. W. Cairns	TEL: 637-4203		

Great Lakes Biolimnology Lab.

Project Number 1304 b - ASSESSMENT OF THE EXTENT AND SIGNIFICANCE OF
ABNORMAL LAKE TROUT GONADS

Relevance

Lake trout populations, once plentiful during the first 30 years of the 20th century, dwindled and collapsed during the period from 1935 to 1950. The causes are numerous; overfishing, lamprey predation and changes in species composition are commonly believed to be the main factors responsible for the near extinction of lake trout in Lake Ontario.

Since the mid 1950's, restoration and rehabilitation of the lake trout populations has been a major objective of both the provincial and state fisheries agencies. The Ontario Ministry of Natural Resources and the New York Department of Environmental Conservation stocked approximately 3.5 million lake trout into Lake Ontario between 1973 and 1978 in an effort to re-establish a viable, self-sustaining population. New York has recently achieved their objective of planting 1 million lake trout yearly into Lake Ontario.

The success of this program depends, in part, on the ability of these animals to reproduce. In 1978, New York reported an anomaly in lake trout testes which appeared as a constriction at irregular intervals along the testis. The significance of the constriction to the reproductive potential of male lake trout and the subsequent impact on the restoration program are unknown.

Aspects Completed During Previous Year

A small sub-sample of five constricted and 3 non-constricted testes were submitted to Dr. Rubia at Concordia for his topathological assessment. Her report (see enclosed abstract) suggested that the constriction was actually an irreversible degeneration of the testis and that fish exhibiting this condition had a 40 to 43 percent reduction in viable sperm. In addition, the affected fish appeared to lag several reproductive stages behind normal fish, suggesting their sexual maturity may not coincide with normal males or spawning females.

The Ontario Ministry of Natural Resources and the Great Lakes Fishery Laboratory are aware of this preliminary report and have agreed to collect data describing the geographical distribution and frequency of occurrence. To date the anomaly has been reported in all of the Great Lakes and several inland lakes. Approximately one hundred males in Lake Ontario have been observed and the frequency of occurrence is approximately 50 percent. None of the 8000 fish examined during the tumour monitoring program, with the exception of lake trout, showed evidence of gonadal constrictions.

The original sample of five constricted and three non-constricted males is too small to permit any definite conclusions. Samples of constricted and non-constricted males have been collected during the 1980 field season and preserved for histological analysis. In addition, five complete testes with and without constrictions have been frozen and will be submitted for contaminant analyses.

CANADA CENTRE FOR INLAND WATERS

- | | | | |
|--------------------------|---|-------------|--------------|
| 1. KEY WORDS | phytoplankton, metals, lake column simulator | PROJECT NO: | 81-FR-BL-019 |
| 2. FILING DATE: | PROJECT YEAR: | DURATION: | one year |
| 3. PROGRAM: | Environmental Toxicology and Surveillance | | |
| 4. PROJECT NAME: | Effects of a mixture of metals on natural phytoplankton communities in lake column. | | |
| 5. DIVISION, UNIT, GROUP | PROJECT GROUP H. Duthie (Univ. of Waterloo)
P.T.S. Wong, S. Millard, M. Munawar, C. Hart (Univ. of Waterloo) | | |

6. OBJECTIVE:

To determine the factors affecting the toxicity of a mixture of metals on natural phytoplankton communities in lake column simulators.

RELEVANCE:

The synergistic and antagonistic interactions of metals are important in our formulation of Great Lakes Water Quality Objectives for metals.

WORK OUTLINE AND DESCRIPTION:

This project will be carried out by C. Hart for his M.Sc. thesis. The professional staff will act in the advisory capacity.

Natural phytoplankton from Lake Ontario water will be exposed to a combination of metal mixtures in Lake column simulators. Physiological (C^{14} uptake) and taxonomic changes in the lake column simulators with and without exposure to metal mixtures will be compared. Factors affecting the metal toxicity will be examined.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

A new project.

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

7. MAN-YEAR EFFORT (GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

CAS:

8. PROJECT LEADER: P.T.S. Wong
S. Millard and M. Munawar

TEL: 637-4559

1. KEY WORDS Surveillance, Contaminants, Fisheries

PROJECT NO: 81-FR-BL-034

2. FILING DATE: Feb. 17/81

PROJECT YEAR: 5

DURATION: Ongoing

3. PROGRAM: Surveillance

4. PROJECT NAME: Great Lakes Contaminants Surveillance

5. DIVISION, UNIT, GROUP

GLBL

PROJECT GROUP

D.M. Whittle, J.D. Fitzsimons &
H.F. Nicholson

6. OBJECTIVE: To describe the levels of selected trace metals and persistent organic compounds in Great Lakes Salmonids and major dietary species of fish, zooplankton and benthic invertebrates. To determine trends in contaminant levels within and between each of the lakes in the Great Lakes system. This program is co-ordinated with other on-going or proposed Federal State and Provincial programs monitoring contaminants in Great Lakes biota.

RELEVANCE: The Water Quality Board of the IJC requests an annual report on the state of the Great Lakes with respect to contaminants and the effect on Great Lakes biota with respect to contaminant burdens.

WORK OUTLINE AND DESCRIPTION:

See next page.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

See next page.

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

To implement some of the recommendations of the Fish Health Workshop and Fish Health Group in the routine monitoring program of the Fish Contaminants Group.

7. MAN-YEAR EFFORT (GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

CAS:

8. PROJECT LEADER: D. M. Whittle

TEL: 637-4565

PROJECT FORECAST

1981-1982

PROJECT NO: 81-FR-BL-034

6.

WORK OUTLINE AND DESCRIPTION

1. Continuing studies to describe the trends in contaminant burdens in top predator fish species, forage species, plankton and benthic macro-invertebrates from selected stations on each of the Great Lakes.
2. Development of the relationship between the inhibition of enzyme activity, blood lead levels and body burdens of total lead in forage fish inhabiting contaminated and uncontaminated sites on the Great Lakes.
3. Environmental distribution and significance of recently identified persistent organic compounds such as Polychlorinated Dibenzodioxins (PCDD's), Polychlorinated Dibenzofurans (PCDF's), Polychlorinated Diphenyl Ethers and Chlorinated Napthalenes.
4. Observation of the degrees of fluctuating asymmetry in fish as a possible indicator of environmental stress.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

1. Development of the relationship between inhibition of enzyme (ALA-D) activity, blood lead levels and body burdens of total lead for several species of fish from contaminated and uncontaminated areas of the Lower Lakes.
2. Development of the ratio of contaminant burdens for whole fish and edible portion samples for selected top predator fish species from the Upper Lakes.
3. Determination of the environment distribution throughout the Great Lakes system of recently identified toxic compounds, ie. Polychlorinated Dibenzodioxins and related photodecomposition products.
4. Determination of the seasonal pattern of contaminant accumulation in two distinct food chains in Lake Ontario.
5. Continued collections of top predator fish species, forage species, plankton and benthic invertebrates at a minimum of three stations on each of the Great Lakes to determine trends in body burdens of contaminants.

1. KEY WORDS		PROJECT NO: 81-FR-BL-036	
2. FILING DATE: JANUARY/1981	PROJECT YEAR: 2	DURATION: 3	
3. PROGRAM: Surveillance			
4. PROJECT NAME: Great Lakes Phytoplankton: Physiological - Ecological Studies			
5. DIVISION, UNIT, GROUP GLBL		PROJECT GROUP H. Shear (C. Nalewajko, K. Lee; Univ. of Toronto)	
6. OBJECTIVE: To determine the role of physical (light, temperature), as well as chemical factors, in the limitation of Great Lakes phytoplankton productivity.			
<p>REFERENCE: The Great Lakes eutrophication control strategy is based on the assumption that phosphorus is the nutrient that can be controlled and that this will result in a limitation of biological productivity in the Lakes. Factors such as light and temperature may be very critical in the limitation of productivity in the cold, deep Upper Lakes.</p> <p>WORK OUTLINE AND DESCRIPTION: Three cruises are planned for 1981 (spring, summer & fall) in the Upper Lakes, with supplementary work en route in the Lower Lakes. Physiological responses of populations to light and temperature will be investigated in an attempt to determine more clearly the role of these factors in regulating productivity. A comparison will be made between Upper and Lower Lakes species to determine if real adaptation to light and temperature exists within a species.</p> <p>ASPECTS COMPLETED DURING PREVIOUS YEAR: A total of five cruises have been completed in the Upper Lakes. Extensive data have been collected on water chemistry, phytoplankton biomass, chlorophyll-a, POC, PON, primary production and phosphorus kinetics at a variety of light intensities. One application has resulted and two are in preparation, on the effects of light regime on phytoplankton productivity and nutrient kinetics.</p> <p>ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S): Will depend on results of 1981 work.</p>			
7. MAN-YEAR EFFORT(GLBL) THIS FORECAST PERIOD		PROF:	TECH: CAS:
8. PROJECT LEADER: H. Shear		TEL: 637-4567	

1. KEY WORDS	Phytoplankton, species, primary productions, chlorophyll, nutrients	PROJECT NO.	81-FR-BL-040
2. FILING DATE:	PROJECT YEAR: 6	DURATION:	continuing
3. PROGRAM:	Surveillance		
4. PROJECT NAME:	Phycological Studies in the St. Lawrence Great Lakes		
5. DIVISION, UNIT, GROUP	GLBL	PROJECT GROUP	M. Munawar, L. Michell, H.F. Nicholson, contract person and summer student

6. OBJECTIVE:

To prepare a comparative overview of the phytoplankton dynamics of the Great Lakes and to evaluate long-term changes of species to nutrient status of the lakes.

RELEVANCE: Generation of consistent data base by means of standard universal procedures is absolutely necessary to study the changing trophic status of the lakes and to develop management strategies as part of the Canadian Commitment to Water Quality Agreement.

WORK OUTLINE AND DESCRIPTION:

- Based on meticulous taxonomic identification and enumeration of phytoplankton, biomass, species and size composition data are generated on a lake-wide basis. These data are then related to nutrient conditions of the biotope to understand the plankton ecology.
- Species data for several years are analysed and interpreted with particular emphasis on the qualitative and quantitative occurrence of "Indicator species" to evaluate long-term floristic trends.
- Recent species data will be related to paleolimnological species information from diatom cores from various parts of the Great Lakes, beginning with the lower lakes.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

- Seasonal and spatial variations of phytoplankton biomass and its species composition were studied for Lake Huron. Input was given to SIL review given at SIL Congress (Japan) and publication or a report.
- Samples from Lake Huron, Georgian Bay and the North Channel were collected at selected stations during the Surveillance cruises. They await microscopic analyses due to lack of funds, etc. during 1980-81. (Projects 040 and 041 have been combined).

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

- Since very little is known about Lake Huron algae, more attention will be given for Lake Huron data analyses for various aspects of algal ecology. Georgian Bay North Channel will receive some time. Joint work with A. El-Sharaawi and T. Bistincki on lake classification and nanio plankton micro-morphology (SEM) respectively will continue.

7. MAN-YEAR EFFORT (GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

AS:

8. PROJECT LEADER: M. Munawar

TEL: 627-4250

1981-82

PROJECT NO: 81-FR-BL-
040

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S) cont'd

- b) Samples collected during 1980 from Lake Huron and the vicinity will be identified and enumerated for indicator species. These data will provide the only connecting link between 1970 and the 1980 processing of Lake Ontario data for long-term trend evolution will be undertaken.
- c) Sediment cores will be collected during the field season. Some of them will be analyzed for diatom distribution.

1. KEY WORDS Nannoplankton, Size fractionation, contaminants		PROJECT NO: 81-FR-BL-041	
2. FILING DATE:		PROJECT YEAR: 1	DURATION: 2
3. PROGRAM: Surveillance			
4. PROJECT NAME: Nannoplankton dynamics in Canadian Lakes.			
5. DIVISION, UNIT, GROUP GLBL		PROJECT GROUP M. Munawar, P. Ross, B.P. Alloul (University of Montreal), L. Michell, C. Mayfield (U. of Water)	
6. OBJECTIVE: To evaluate the importance of nannoplankton and protozoans in the food ratio of zooplankton, and in the transfer of energy and contaminants in the pelagic food chain. Also, to determine efficiency of nannoplankton retention in filtration procedures and to explore nannoplankton/bacterial associations in the plankton assemblage.			

RELEVANCE: Zooplankton's demonstrated preference for nannoplankton in grazing provides an extremely important tool to study the contaminants pathway to the secondary trophic level. This will bridge a key information gap concerning the effects of contaminants on biota as required by the Water Quality Agreement (Annex 12, 4b).

WORK OUTLINE AND DESCRIPTION: Size selective insitu grazing experiments will be carried out in the Great Lakes. Efficiency of nannoplankton selection will be tested by various filters and membranes with the help of scanning electron microscopy and insitu fluorescence. Identification and enumeration of protozoans will be carried out to estimate their contribution to the plankton assemblage about which very little is known in the Great Lakes. Nannoplankton and bacteria will be sampled by means of epifluorescent and autofluorescent techniques.

ASPECTS COMPLETED DURING PREVIOUS YEAR: Preliminary grazing experiments in Lake Ontario were carried out in the summer of 1980 (Ross and Munawar, in press). SEM studies of filter type were carried out. Experiments concerning phytoplankton passage through filters were conducted.

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S): Further experiments will be carried out as described above in the Great Lakes and other Canadian lakes in conjunction with the staff of University of Montreal and University of Waterloo.

7. MAN-YEAR EFFORT (GLBL) THIS FORECAST PERIOD		PROF:	TECH:	CAS:
8. PROJECT LEADER: M. Munawar		TEL: 637-4250		

1. KEY WORDS	Biological Archive, Organochlorine Residues	PROJECT NO:	81-FR-BL-050
2. FILING DATE:	Jan 12/81	PROJECT YEAR:	3
3. PROGRAM:	Surveillance	DURATION:	Ongoing
4. PROJECT NAME:	Biological Tissue Bank		
5. DIVISION, UNIT, GROUP	GLBL	PROJECT GROUP	J.D. Fitzsimons, D.M. Whittle
6. OBJECTIVE:	<p>To define the storage conditions required for maintaining the integrity of chlorinated hydrocarbon residues for extended periods in a variety of biological tissues.</p> <p>RELEVANCE:</p> <p>The 1979 Great Lakes Water Quality Agreement outlines the need for this study. Once analytical capacity/capability is established for the determination of pesticide and non-pesticide halogenated hydrocarbons, it will allow for the accurate retrospective monitoring of these compounds in various tissue archives.</p> <p>WORK OUTLINE AND DESCRIPTION:</p> <ol style="list-style-type: none"> 1. Completion of a study to evaluate losses of chlorinated hydrocarbons (CHC) from frozen (-20C, -40C) whole fish homogenates over a 96 week period. The use of fast freezing homogenates with liquid nitrogen is also being evaluated. 2. Completion of a study to evaluate losses of CHC from <u>Mysis</u> (opossum shrimp) homogenates either dried at 60C and stored at room temperature or stored frozen (-20C, -40C), over a 96 week period. 3. Continuation of a 96 week study to evaluate losses of CHC from net plankton homogenates either dried at 60C and stored at room temperature or stored frozen (-20C, -40C). 4. Continuation of a study to evaluate losses of CHC from florasil extracts of whole fish homogenates, stored at room temperature for periods up to 2 years. 5. Initiation of a 96 week study to evaluate losses of radiolabelled PCB (Aroclor 1254) from fish homogenates stored at various temperatures (-20C, -40C, -80C, -196C) using various extraction techniques. Preservation (formalin) and alternative tissue types (fillet, liver) will also be evaluated for their archiving potential. <p>ASPECTS COMPLETED DURING PREVIOUS YEAR:</p> <ol style="list-style-type: none"> 1. Completion of study to evaluate losses of CHC from whole fish homogenates during freeze-drying, and losses over a 96 week period from frozen and freeze-dried homogenates. Data indicates significant losses both upon freeze drying and over a 48 week period in frozen storage (-20C). 2. Completion of study to evaluate losses from zooplankton of radiolabelled PCB (Aroclor 1242) at 60C and of HCB at 30C and 60C. Significant losses were observed for both compounds. Preservation (10% neutralized formalin) led to an apparent increase in PCB levels which appeared to be attributable to sample dehydration. <p>ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(s):</p> <p>See next page.</p>		
7. MAN-YEAR EFFORT (GLBL) THIS FORECAST PERIOD	PROF:	TECH:	CAS:
8. PROJECT LEADER:	D. M. Whittle		TEL: 637-4565

PROJECT FORECAST 1981-82

PROJECT NO.: 81-FR-BL-050

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

1. Completion of all ongoing projects as described in the work outline.
2. Initiation of study to evaluate losses of radiolabelled HCB from fish homogenates at various temperatures over a two year period. HCB is a good model for defining archiving conditions because of its relatively high volatility.
3. After defining the appropriate storage conditions for archiving biological tissues a comprehensive study involving the contamination of fish in a continuous flow system with a variety of halogenated organic compounds (e.g. aromatics, aliphatics, PAHs) would be most valuable. The subsequent long term storage of the contaminated fish homogenates would allow a more predictive approach in future, enabling interest groups to determine the probable life expectancy of a tissue bank, with its attendant storage parameters, for a new contaminant.

1. KEY WORDS	Dredging, bioassessment	PROJECT NO: 81-FR-BL- 077	
2. FILING DATE:	January. 1981	PROJECT YEAR: 2	DURATION: 2 years
3. PROGRAM:	SURVEILLANCE		
4. PROJECT NAME:	Effects of Dredge Spoils on Natural Phytoplankton		
5. DIVISION, UNIT, GROUP	PROJECT GROUP H. Shear, M. Munawar, H. Nicholson, GLBL, NWRI R. Thomas; A. Mudroch (NWRI)		
6. OBJECTIVE:	To determine the impact of heavy metals derived from polluted sediments on various components of the phytoplankton community, by developing appropriate bioassays. This work may eventually lead to the development of new dredge spoil disposal criteria.		
RELEVANCE:	1978 Great Lakes Water Quality Agreement, Article VI-g, Annex 1. Development of new dredging criteria, using data on real populations is of critical importance. Present criteria for dredge spoil disposal used in Canada are based on bulk chemical composition of dredged sediment. In U.S., the dredged material is evaluated by chemical tests and bioassays after the material is mixed with disposal site matter. These bioassays use phytoplankton cultures, and may not represent the true impact of dredging on the environment.		
WORK OUTLINE AND DESCRIPTION:	Samples will be collected from harbours and river mouths in L. Ontario. Sediment will be chemically characterized and an appropriate bioassay run on each sample. All the currently accepted bioassay techniques will be evaluated in order to develop a protocol for the treatment of dredge spoil from its collection in the field to the final written assessment of its state of contamination. Chemical characterization will be correlated with biological availability of pollutants. Initial work will be limited to the availability of the metals. Effect of metals on various size fractions will continue, as will SEM and autoradiology work.		
ASPECTS COMPLETED DURING PREVIOUS YEAR:	A comprehensive literature review was completed in November/80. Based on recommendations from this review, preliminary laboratory and field work was carried out from Dec./80-March/81. Samples from Hamilton Harbour and western Lake Ontario were characterized chemically. Bioassays utilizing ¹⁴ C incorporation were performed. Phytoplankton were fractionated into various size fractions (<5 µm, 5-10, 10-20, 20-30, 30-64, >64 µm). Affected fractions were studied using scanning electron microscopy. Autoradiographic techniques were also employed to determine affected species.		
ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):	Samples from additional geographical areas will be analyzed. All bioassay techniques will be assessed. Comparison of bioavailability data with chemical speciation will be made. Initial steps will be taken to develop new criteria for dredge spoil disposal.		
7. MAN-YEAR EFFORT(GLBL) THIS FORECAST PERIOD	PROF.	TECH:	CAS:
8. PROJECT LEADER: H. Shear	TEL: 637-4567		

PROJECT NO: 81-FR-BL-099

1. KEY WORDS

2. FILING DATE: JANUARY/1981

PROJECT YEAR: FIRST

DURATION:

3. PROGRAM: Surveillance

4. PROJECT NAME: Long-term Biological Index Monitoring

5. DIVISION, UNIT, GROUP PROJECT GROUP: H. Shear, K. Minns, M. Munawar, R. Dermott,
GLBL-NWRI H. Nicholson: (J. Barica, A.EL-Shaarawi, F. Rosa + Tech Ops NWR)

6. OBJECTIVE: To determine the long term trends in Great Lakes biota in response to management of nutrient sources. This will be accomplished by first elaborating the seasonal variability of biological and chemical parameters that control the aquatic ecosystem, and then by monitoring them on a long term basis at selected sites and times. To elucidate differences between open lake and nearshore areas. To provide a sufficient data base for statistical analysis.

RELATIONSHIP:

This project is directly related to the IJC GLISP and will begin by sampling Lake Ontario during the intensive years. The output of this may be used to modify GLISP sampling strategies.

WORK OUTLINE AND DESCRIPTION:

Integrated zooplankton, phytoplankton and chlorophyll-a samples will be taken in duplicate at the primary stations (Fig.1) every week from the end of March until ice-up. In addition, water chemistry samples will be taken by a similar method to that of the main surveillance cruises. Discrete chlorophyll-a samples will also be taken. On a tri-weekly basis, two additional stations will be sampled (Fig.1). Six times per year replicate benthos samples will be collected at the stations shown (Fig.1). An EBT and transmissometer trace will be taken at each station. Bottom or sediment temperature will be recorded at each benthos collection.

Stations selected are ones that form part of the GLISP.

ASPECTS COMPLETED DURING PREVIOUS YEAR:

Although this is a new project, it will make use of existing surveillance stations. As well, past data will be used in an attempt to determine, more precisely, seasonal variability.

ASPECTS TO BE COMPLETED IN FOLLOWING YEAR(S):

This is a pilot project, initially concerned with Lake Ontario. It is anticipated that the other lakes will be sampled, on a long term basis, with more time-intensive sampling in future years, once seasonal variability has been established for each lake.

7. MAN-YEAR EFFORT (GLBL)
THIS FORECAST PERIOD

PROF:

TECH:

8. PROJECT LEADER: H. Shear

TEL: 637-4567

*on a consultation basis.

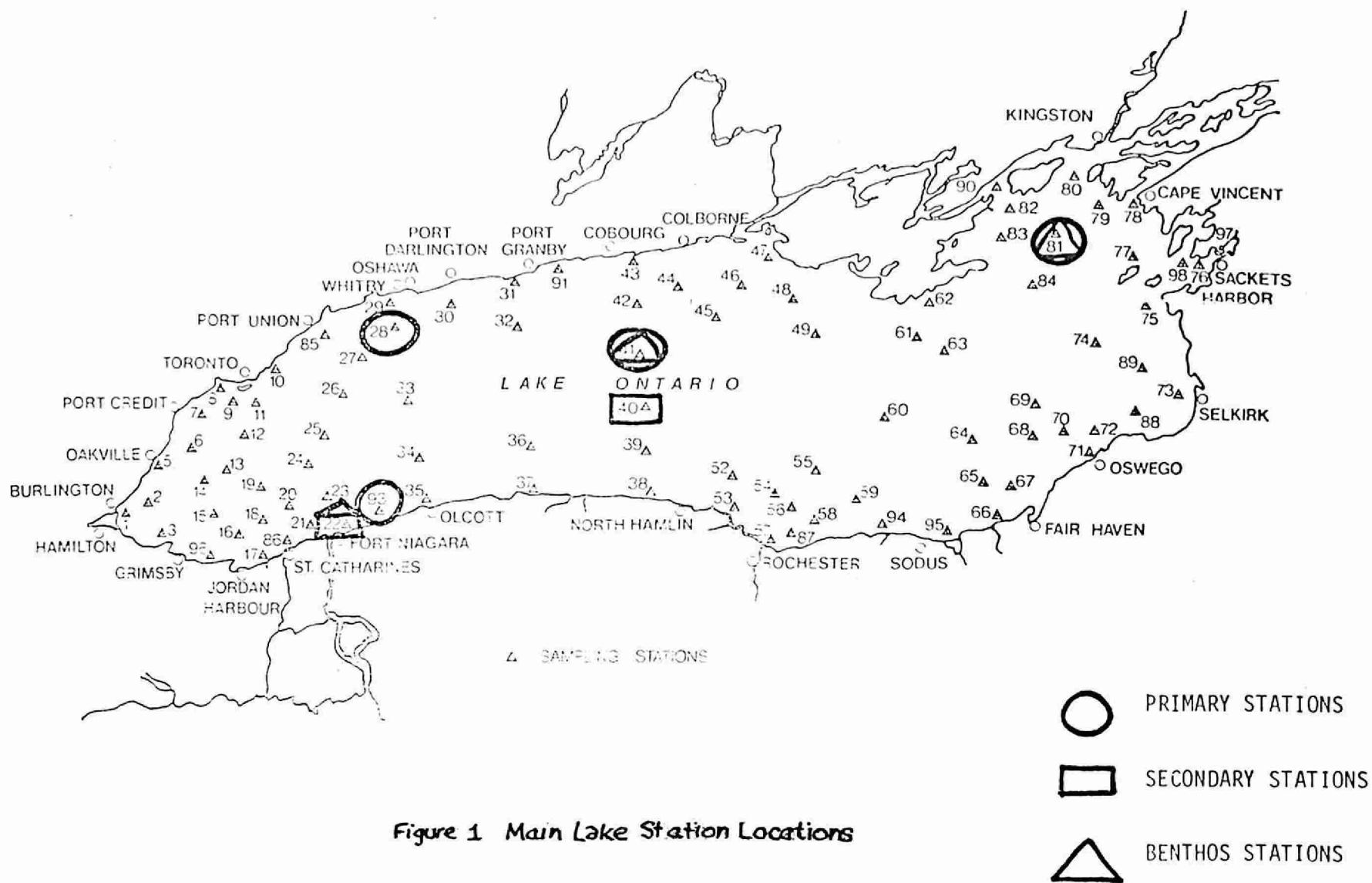


Figure 1 Main Lake Station Locations

FEDERAL
SUMMARY OF RESOURCES
1981/82

SUMMARY OF FEDERAL RESOURCES BY AGENCY (\$K)

<u>ENVIRONMENT CANADA</u>	<u>P/Y</u>	<u>SAL</u>	<u>O&M</u>	<u>CAP</u>	<u>TOTAL</u>
IWD/Ontario Region ¹	28.5	745.0	458.8	136.0	1339.8
National Water Research Institute ²	19.0	503.0	160.0	103.0	766.0
Canadian Wildlife Service	4.0	100.3	122.0	12.0	234.3
 <u>FISHERIES & OCEANS CANADA</u>					
Great Lakes Biolimnology Laboratory ³	8.0	193.0	302.0	33.5	528.5
Ship Support ⁴	9.9	247.5	413.4	-	660.9
TOTAL	69.4	1788.8	1456.2	284.5	3529.5

¹ Includes Overhead

² Does not include building overhead, library services

³ Includes 74K external funding from DOE

⁴ Includes support for open lake/connecting channel surveillance

SECTION 2

ONTARIO MINISTRY OF THE ENVIRONMENT
GREAT LAKES SURVEILLANCE PROGRAM
1981/82

LAKE HURON

OBJECTIVE: To complete analyses and reporting activities associated with the 1980 Lake Huron intensive year studies; to maintain surveillance over the water quality impacts of construction activities and flow alterations in the St. Mary's River and to continue long-term trend monitoring of trophic status in the Penetang to Waubaushene area of Georgian Bay relative to increasing development.

SCOPE: This year's activities include:

- detailed analysis and interpretation of information arising from the nine Lake Huron projects carried out during 1980 leading up to the preparation of the respective project reports and the final summary report
- four synoptic surveys in the area downstream of the Great Lakes Power Co. development and Algoma Steel Corp.
- bi-weekly monitoring of trophic status indicators at five representative locations in the embayments from Penetang to Waubaushene

LAKE ERIE

OBJECTIVE: To maintain surveillance of water quality conditions in the industrialized areas of the St. Clair River and Nanticoke; to update Detroit River response to municipal discharge improvements and to gather additional baseline data on sediments and water quality off the Grand River mouth prior to the commencement of industrial waste treatment and disposal activity at the South Cayuga site.

SCOPE: The four projects planned for Lake Erie include:

- the short-term intensive assessment of phenolics and other organics downstream of industry in Sarnia, Moore and Sombra Townships and follow-up investigation of public health indicator bacteria and sources in Sarnia Bay
- two bacteriological surveys of the Ontario shoreline of the Detroit River influenced by urban drainage
- tri-weekly monitoring of water quality and phytoplankton at 6-9 locations offshore of the Nanticoke development
- examination of trace contaminant levels in water suspended sediment and lake sediments in the depositional area off the Grand River mouth

LAKE ONTARIO

- OBJECTIVE: To maintain and intensify surveillance and assessment of water quality in the nearshore and problem areas consistent with the international intensive year requirements and to gather information relative to ongoing pollution abatement programs.
- SCOPE: The 1981/82 program is being implemented under eight project headings and involves 17 sub-activities including:
- continued surveillance of contaminant trends and source identification in the Niagara River
 - continuation of the spring nearshore synoptic survey of nutrients and trophic status indicators
 - investigation of nearshore variability and its driving forces through weekly monitoring of inshore-offshore transects at Scarborough, Mississauga and Grimsby
 - baseline monitoring of metals and trace organics in in raw water at selected intakes
 - updating of attached algae growth and coverage since the IFYGL studies of 1972
 - characterization of zoobenthos and sediment quality changes occurring since 1966/67
 - further definition of oxygen depletion rates and areal coverage in the eastern basin
 - finalization of the Hamilton Harbour report summarizing studies which have been ongoing since 1972
 - continuation of daily sampling at four locations representative of Toronto inner and outer harbours, Humber Bay and the lake south of the islands as a measure of both long and short-term response to remedial activity and ongoing development
 - examination of contaminant residues in the food web and sediments at six sites close to and remote from Toronto area sources
 - examination of Toronto area water movement, inshore-offshore exchange and harbour-lake exchange to assist in evaluating effects of landfilling and dredged spoils disposal activities and in determining optimal outfall locations

- follow-up assessment of mixing processes at the mouth of the Ganaraska River
- low level monitoring of Bay of Quinte response to phosphorus controls
- follow-up investigation of contaminant trends and source correction in the Cornwall-Massena area of the St. Lawrence River

BASIN WIDE STUDIES AND SUPPORT ACTIVITIES

- OBJECTIVE: To maintain surveillance of water quality issues common to all the Great Lakes, to provide on demand evaluation of effluent requirements and other controls relative to new and expanded discharges or new waterfront development and to satisfy the information needs of the IJC, the COA Review Board, the public and other government agencies.
- SCOPE: Eleven separate activities have been identified. These include:
- effluent requirement setting for new and expanded municipal and industrial discharges
 - enhanced monitoring of Great Lakes tributaries for loading evaluation
 - trend monitoring of contaminants in young-of-the-year fish
 - weekly monitoring of raw water quality at 13 municipal water intakes for evaluation of long-term phytoplankton, nutrient and major ion trends
 - weekly monitoring of nutrients and major ions at Lake Superior, Lake Huron and Lake Erie outlets to assist in trend and interlake mass balance loading calculations
 - baseline evaluation of contaminant levels in the water, sediment and biota of two Great Lakes wetlands
 - surveillance of radionuclides in the vicinity of uranium refining and nuclear power facilities
 - maintenance and updating of the SIS-Great Lakes data storage and retrieval system and application of statistical and plotting techniques in the automated processing and presentation of water quality data
 - on demand response to requests from the IJC, the Review Board, consultants, other government departments and the public for raw and interpreted water quality information.

Reporting

Several levels of reporting are supported under the Provinces' Great Lakes Surveillance program. The report types include.

1) On Demand Abatement Related Reports

The 1978 Great Lakes Water Quality Agreement and provincial Water Management Goals call for the timely implementation of remedial programs that result from surveillance findings. The principal of early warning and detection of problem areas by surveillance under GLISP also necessitates an effective interface to remedial programs. First priority is therefore placed on the interface of the Great Lakes surveillance program to the Province's Regional and head office abatement programs.

Reporting under this category include:

- i) internal technical assessments and memoranda
- ii) consultation
- iii) specifications for certificates of approval, water taking and discharge permits, dredging approvals and control orders.
- iv) Review of proponent submittals under the Province's Environmental Assessment Act and the Federal Environmental Assessment Review Process (EARP).

2) Reporting under the 1978 GLWQ Agreement

The province is a key contributor to the reports of the IJC under the Great Lakes Water Quality Agreement. This includes annual submissions updating the status of problem areas, detailed bi-annual surveillance reports and special reports. The primary mechanism for reporting to the Water Quality Board is through the Surveillance Workgroup.

3) Reporting under the Canada-Ontario Agreement (COA)

Under COA the province contributes reports

- i) on an annual basis as part of the annual surveillance program review
- ii) special reports such as the Niagara River Baseline Report jointly co-authored by Provincial and Federal personnel and released by the COA Surveillance Committee or the Review Board. The reports relate to assessments in areas of common interest and where administrative jurisdiction overlaps.

4) MOE Green Cover Water Quality Assessment Reports

These reports are prepared on an ongoing basis and focus on water quality assessments of local areas, and or issues. Topics range from assessments related to pre and post operational effects of development, response to remedial measures, water management, objective setting, and water quality documentation.

5) MOE Technical Reports

These reports focus on technical issues related to the support of the surveillance program including:

- i) laboratory documentation of materials and methods, data quality, data management, instrumentation, etc.
- ii) field reports documenting materials and methods used in field surveys, instrumentation, etc.
- iii) software documentation for EDP systems support for data management and analysis.
- iv) surveillance plans, cruise plans, network strategies
- vi) training manuals, implementation guidelines, etc.

6) Special Reports

Because of the broad scope of water management in the coastal zone of the Great Lakes, special reports are co-authored to support ministry participation on inter- and intra- governmental workgroups, committees, task forces, etc. eg. PLLARG, ULRG, NEC, etc.

7) Scientific Papers

Personnel are encouraged to publish scientific articles in journals, conferences, etc. at their discretion for professional development.

SITE SPECIFIC STUDIES

LAKE HURON (including Georgian Bay
and North Channel)

PROJECT TITLE: ST. MARYS RIVER

Background: Phenol levels in 1980 showed some changes from those in 1979. Cyanide and ammonia levels were in compliance with Agreement Objectives.

Phase I of construction at Great Lakes Power is completed. Data collected by the proponent indicated no impairment of river water quality during this stage. A monitoring program has been provided by the proponent's consultant for Phase II construction and has been approved by the Ministry. A list of "Alerting" water quality levels derived by the Ministry have been provided to the proponent, Environment Canada and the Lake Superior Water Level Control Board to measure the magnitude of impact during Phase II construction. Action plans are to be taken if the levels are exceeded.

Objectives: To assess progress of current abatement measures and the need for further remedial programs.

To assess the impact of construction activities on river quality and on the assimilative capacity of the river to disperse industrial pollutants from Algoma Steel.

Scope: Four cruises are planned to monitor river quality. Analyses will include; phenolic compounds, cyanide, ammonia, heavy metals, bacteria, turbidity, pH and temperature.

Output: Data will be reviewed and summarized for regional abatement staff and for inclusion in the bi-annual report to Water Quality Board.

PROJECT TITLE: PENETANGUISHENE-WAUBAUSHENE

Background: Previous investigations by the Ministry of the Environment have indicated eutrophication problems in Penetang and Midland Bays. Existing sewage treatment plants in the area are removing phosphorus from treated effluent; however, several facilities are in need of major renovation and expansion. A new plant for Penetanguishene is presently under design (design capacity = 1 M.G.D.). The Midland plant now discharging 1.25 M.G.D. (primary treatment and P removal) is now undergoing reconstruction to a 3 M.G.D. secondary treatment facility with offshore discharge. A new sewage treatment plant for Victoria Harbour (20 yr. design cap. = 0.8 M.G.D.), discharging to Sturgeon Bay, will become operational in 1981/82.

Objectives: Assess the rate and degree of change in water quality as a result of changing and expanding sewage treatment facilities at local municipalities.

Scope: Sampling will be undertaken bi-weekly throughout the ice-free portion of the year. Based on evaluation of past data, an efficient grid of 5 stations will be sampled for a variety of eutrophication parameters.

Output: Summary report to Regional staff and Head Office and input to the bi-annual report to Water Quality Board.

LAKE ERIE

PROJECT TITLE: ST. CLAIR RIVER

Background: The St. Clair River Organics study is complete and several reports are available.

Other reports dealing with the identification of dissolved organic compounds and the impact on fish tainting are underway. Findings indicate that significant improvements have taken place during the last decade. Remedial measures undertaken at municipal and industrial sources are major contributions to the observed improvements.

A local bacteriological problem in Sarnia Bay has resulted in beach closure during recreational periods. This problem is due to storm and sanitary bypass sewers.

Objectives: Maintain surveillance of phenolic compounds in the river to assess the progress of remedial measures.

Assess the effect of storm and sanitary bypass discharges on the bacteriological water quality of Sarnia Bay and to identify remedial actions required.

Scope: One cruise is scheduled for the sampling of phenolic compounds in the river with emphasis on source areas. Nutrient and dissolved organic carbon will also be measured.

Public health microbiological indicators will be sampled along the Sarnia Waterfront during two cruises (spring and summer). Approximately 150 samples will be collected during each cruise. Staff of MOE London Regional office will co-ordinate with the city for the collection of two to three sets of samples during storm events at the storm and sanitary bypass sewers.

Output: Report to MOE Regional staff and input to the bi-annual report to Water Quality Board.

PROJECT TITLE: DETROIT RIVER

Background: Past water quality investigations in the river have revealed improvement in bacteria levels along the Ontario shoreline of the river as well as identifying further sources of bacterial contamination along the Windsor and Amherstburg municipal waterfronts. Remedial actions to correct these problems are being pursued by MOE with the municipalities.

Objectives: Maintain surveillance of public health indicator bacteria along the Ontario shoreline of the river.

Scope: Two cruises are planned which include head and mouth transects as well as transects located downstream of known point sources adjacent to Windsor and Amherstburg.

Output: Status report to the Michigan-DNR, IJC Regional Office and MOE Southwestern Region.

PROJECT TITLE: NANTICOKE

Background: Large-scale industrial and municipal development is taking place in the Nanticoke coastal region of Long Point Bay. To protect water quality, chemical, biological and physical conditions have been monitored since 1968 by the Nanticoke Environmental Committee, representing MOE, MNR, Ontario Hydro, Stelco and Texaco. Stelco began operation in April 1980, and Phase I to be completed in 1981 or 82. The monitoring will continue until 1984.

Objectives: Maintain surveillance of the impact of increased municipal and industrial development at Nanticoke.

Scope: Water quality and phytoplankton will be monitored on 15 cruises at 6-9 stations from mid-April to November. Fish and zooplankton studies will be continued by Ontario Hydro and MOE.

Output: Annual reports on the individual studies. A report integrating all studies from 1968 to 1978 is under preparation.

PROJECT TITLE: CONTAMINANTS BACKGROUND FOR GRAND RIVER MOUTH

Background: Previous water quality studies in the Grand River mouth area and along the shoreline of Eastern Lake Erie have indicated that the impact of river discharges extend as far east as Port Colborne. The impact on the Dunnville water intake is discontinuous and persists for a period of about 1 month during the winter.

Previous studies have focussed on nutrient enrichment issues and this study will focus on the establishment of background environmental contaminants conditions.

Objective: Define background contaminants levels in water, sediments, and biota.

Scope: Sampling will include suspended sediment, benthos, fish and sediment during spring and summer.

Analysis for trace contaminants will be undertaken in replicate core sediment samples.

Analysis of biological and sediment materials will include broad spectrum scans for trace metals, organochlorine compounds, and organophosphorus compounds. Selected samples will be analyzed by GC/MS.

Output: Data will be reviewed and summarized for regional abatement staff.

LAKE ONTARIO

PROJECT TITLE: NIAGARA RIVER

Background: The input of many persistent toxic contaminants from industry and waste disposal sites in New York State, and their possible effects on water use, has received considerable attention over the past two years. An international committee, with representatives from the U.S. and Canada, was formed in 1980 to oversee monitoring of the Niagara River.

Studies conducted in 1979 revealed elevated concentrations of heavy metals and organochlorine compounds in suspended solids and sediment samples from several locations in the Niagara River.

Range surveys conducted in 1980 indicated levels of coliform organisms above objectives, particularly in the U.S. waters of the upper Niagara River. In addition, preliminary results of a biomonitoring study using caged fresh-water clams indicated their usefulness in identification of organic trace contaminant sources and in studying uptake rates.

The effect of contaminants on aquatic habitat and drinking water requires further study and trend evaluation.

Objectives: Determine sources of persistent toxic contaminants and bacteria.

Investigate uptake rates and bioaccumulation of persistent toxic contaminants in biota located in source areas. These will include both native fauna as well as introduced (caged fresh-water clams).

Assess the impact of contaminant discharges on water, suspended sediment and biota in the lower Niagara River.

Scope: A number of cruises will be carried out in the Niagara River with emphasis on water, suspended sediment, bottom sediment and biota. These studies will be carried out in conjunction with the Ministry's young-of-the-year fish, fresh-water clam and drinking water quality monitoring programs as well as in co-operation with the Canada DFE Suspended Sediment Study and Niagara-on-the-Lake Water Intake Program. Assessment of sources will be co-ordinated with the Ministry's Regional Office and the New York DEC.

Output: Ministry reports, including findings and recommendations, will be forwarded to Regional staff and concerned agencies in early 1982.

PROJECT TITLE: NEARSHORE LAKE ONTARIO

Background: Previous studies have indicated that nutrient levels in the nearshore zone of Lake Ontario are sufficiently high to induce localized phytoplankton blooms and prolific Cladophora growth where suitable substrate exists. Recent analyses have shown the existence of regional differences in water quality of the nearshore. Five statistically different regions were identified between Niagara River mouth and Port Hope. Recent investigations have identified a pronounced inshore-offshore gradient in water quality; distinct vertical partitioning of nutrients and phytoplankton under stratified conditions; and a potentially significant contribution of nutrients from sediments and littoral drift. These findings have a significant bearing on future assessments of shoreline developments and on the interpretation of phosphorus management models.

(1) Objectives: Define regional differences in water quality of the nearshore with emphasis on trophic status definition.

Ongoing assessment of trends in nearshore nutrient levels.

Scope: One cruise (consisting of triplicate sampling) will be undertaken in the spring of 1981 in the nearshore zone between the Niagara River mouth and Kingston. A system of transects extending from shore to the 50 m depth contour will be monitored for nutrients and associated water quality parameters. This component will define regional differences in nearshore water quality.

(2) Objectives: Detect seasonal trends in nutrient levels and plankton biomass.

Continue to assess the effectiveness of phosphorus control programs by studying the response of the nearshore biological community.

Scope: Three of five previously documented water quality regions will be monitored weekly throughout the ice-free period, along one representative transect situated in each region.

To aid the interpretation of water quality information a system of in-situ continuous temperature recorders will be installed at one station along each transect to monitor

upwelling/downwelling frequency. All stations along the transect will be monitored weekly, with depth, for nutrients and associated parameters. This component of the program will provide information for the assessment of nearshore trends in water quality and trophic status.

Plankton will be sampled to assess the potential of the nearshore zone for phytoplankton production in relation to nutrient availability and to detect long-term changes in phytoplankton zooplankton population structure. Selected transect stations will be sampled for plankton which will be speciated and enumerated. Concurrent primary productivity and heterotrophy studies will be continued to detect differences in nutrient assimilation between the different nearshore regions and between inshore-offshore regimes and to determine what role heterotrophy plays in utilization of the various phosphorus forms.

Output:

Data will be used to update Lake Ontario water quality assessment (eutrophication section), appearing in the 1981, IJC Report on Great Lakes Water Quality.

PROJECT TITLE: NEARSHORE LAKE ONTARIO - SPECIAL INTENSIVE YEAR STUDIES

The International Great Lakes Surveillance Plan (GLISP) schedule outlines intensive water quality surveillance efforts during 1981/82 on Lake Ontario. During the 1981 field season, several special investigations will be undertaken in addition to the regular ongoing Lake Ontario Nearshore Surveillance Program. The following projects address issues related to trace contaminants and nutrient enrichment:

1) BACKGROUND TRACE CONTAMINANTS - INTAKES

- Background: Trace contaminants in the Great Lakes, in particular the Lake Ontario basin has become a major environmental issue over the past several years.
- Objectives: To document background levels of trace contaminants in municipal intakes.
- Scope: Raw waters (prior to treatment) will be sampled at municipal water treatment plants at Niagara-on-the-Lake, Grimsby, Oakville, Toronto, Cobourg, Kingston and Brockville. Sample frequency will vary from weekly to monthly with analysis to include heavy metals, PCB's and pesticides.
- Output: Ministry report documenting background trace contaminants levels in nearshore waters.

2) NEARSHORE CLADOPHORA ASSESSMENT

- Background: The growth of the alga Cladophora is highly visible evidence of nutrient enrichment and has affected recreational, economic and aesthetic values of the Great Lakes.
- Recent studies by MOE have shown that Cladophora bioaccumulates a variety of contaminants (phosphorus, heavy metals, PCB's) which suggests that the alga can be employed as a practical biomonitoring tool.
- Objectives: To measure the present status of Cladophora growth and nutritive status. To determine trends in nearshore Cladophora by comparison with data from the 1972 IFYGL study.
- To define background contaminants levels in Cladophora tissue-near suspected point source discharges.

Scope: Seven sites from the 1972 IFYGL study will be sampled monthly to include measurements of algal standing crop.

Thirty additional sites near known or suspected point source discharges of contaminants will be sampled bi-weekly, composite alga samples will be analyzed for trace metals and organic trace contaminants.

Output: Reports will be prepared for the two components of the study.

3) NEARSHORE SEDIMENT AND BENTHOS

Background: Sediment and benthos are effective tools for the early warning and detection of water quality degradation particularly when related to the trace contaminants and nutrient enrichment issues.

Objectives: To establish baseline information on nearshore benthos and contaminants residues in sediments.

Scope: Sediment and benthos will be sampled at 60 stations from 20 inshore/offshore transects. Benthos will be enumerated to species and sediments will be analyzed for nutrients and contaminants. Benthos results will be compared to a previous 1967 MOE assessment.

Output: Ministry report documenting regional differences in benthos and sediment and a comparison with previous 1967 benthos data.

4) OXYGEN DEPLETION IN THE EASTERN SECTOR OF LAKE ONTARIO

Background: Low dissolved oxygen levels have been noted in the hypolimnion of Lake Ontario off Prince Edward County.

Objectives: To define the severity, extent and duration of oxygen depletion.

Scope: Four summer cruises will be undertaken to vertically profile temperature and dissolved oxygen.

Output: Update problem area status in the bi-annual report to Water Quality Board.

PROJECT TITLE: HAMILTON HARBOUR

Background: Previous intensive studies of Hamilton Harbour have identified a number of problems associated with past and present industrial and municipal discharges.

Harbour sediments are heavily contaminated and act as a potential source of heavy metals, organic contaminants and nutrients. Severe oxygen depletion occurs during the summer. Oxygen depletion appears to have been partially offset by artificial mixing conducted by MOE during 1975-1978 and by vortex mixing initiated by McMaster University in 1977.

The aeration project was discontinued in 1979 to assess its effectiveness.

Objectives: Assess the importance of ammonia, dissolved organic carbon and reduced sulphur compounds in the process of oxygen depletion.

Determine chemical zonation and limited use zones on the harbour.

Determine the relative magnitude of storm sewer loadings to the harbour.

Determine effectiveness of artificial mixing on oxygen levels in the harbour.

Scope: No further field work is planned for 1981/82. Data collected over the last several years will be analyzed in depth to assess present water quality in the harbour, quantify the processes affecting it, and predict the effects of possible management options.

Output: Ministry reports including findings and recommendations to be forwarded to regional abatement staff and other involved agencies. A summary report assessing the present status of water quality in the harbour, trends 1974-80 and the effects of possible management options on the water quality.

PROJECT TITLE: TORONTO HARBOUR AND AREA WATERFRONT

Background: Intensive studies conducted in 1978 and 1979 have delineated the extent of water quality impairment associated with the Don River and the city storm and combined sewer overflows.

Intensive investigations conducted in 1980 at the lakefill endikement on the Outer Harbour East Headland for disposal of Keating Channel (Don River mouth) contaminated dredge spoil have documented the effect of the lakefill and dredge disposal activities on adjacent water quality.

A potential problem of heavy metals and trace organic contamination still exists in the water and sediments of the harbour. The effect of these contaminants on resident biota is largely unknown.

Nearshore water movements, nearshore-offshore and harbour exchange rates govern the dispersion and assimilation of pollutants discharged to the Toronto area waterfront from sewage treatment plants, storm sewers, industry, generating stations, urban rivers and waterfront construction projects. The proximity of major municipal water supply intakes and water based recreational areas dictates that water movements along the shoreline, as governed by physical and meteorologic variations, be well understood in time and space for use in the assessment of existing and proposed management options and control measures.

1) TORONTO HARBOUR DAILY

Objectives: Assess the effectiveness of remedial measures on water quality in the harbour.

Document changes as a result of anticipated reductions in loadings.

Scope: Four stations (representing inner harbour, outer harbour, Island Filtration Plant and Humber Bay) will be monitored daily during the summer to detect seasonal changes in water quality.

Specific point source discharges will be monitored twice weekly throughout the year to assess their loading contribution to the harbour. Routine beach monitoring will be conducted from May to September. This study is done in co-operation with the City Public Works Department and the City Public Health Department.

Output: Ministry reports will be prepared in 1981, including findings and recommendations, to be forwarded to regional abatement staff and other involved agencies.

2) BIOMAGNIFICATION

Objectives: Investigate the degree of biomagnification of heavy metals and organic trace contaminants in the biota of the harbour to establish accumulation ratios for, plankton, sediments, invertebrates, fish and macrophyte components of the food web.

Scope: Selected stations in the Humber Bay, inner harbour, Island Lagoons, outer harbour, Main STP outfall and the Keating Channel dredge disposal area will be investigated in order to assess the severity of the contaminants problem in the Toronto area. At each station water, plankton, sediments, benthos, fish and macrophytes will be analyzed for heavy metals and organic trace contaminants. Body burdens will be established for affected biota.

Output: The results of this study and recommendations will be communicated to the Region and concerned agencies. A ministry report will be prepared in 1982.

3) IMPACT OF LANDFILLING AND DREDGING

Objectives: Investigate impacts of landfilling and dredge spoil disposal activities and assess interactions from these sources with STP discharges and determine the effects of these activities on water quality at nearby municipal water intakes.

Scope: Intensive surveys and drogue measurements will be conducted throughout the field season around the active landfill disposal site in conjunction with sampling of raw water at R.C. Harris' and Island filtration plants.

Output: Data will be used primarily in Ministry progress reports to Regional staff.

4) WATER MOVEMENT

Objectives: As the basis for assessment of management options and control measures, define nearshore water movements for the Toronto area waterfront, nearshore-offshore and harbour exchange rates and associated pollutant dispersion characteristics.

Scope: Installation of recording current meters for a one year period at four to six locations in the eastern nearshore zone west of the R.C. Harris water treatment plant; associated drogue tracking at the Main STP and meteorologic observations. Periodic measurements of physical gradients in the same zone.

Periodic measurement of current profiles in the Western Channel and East Gap of Toronto Harbour.

Output: Definition of water movements and physical and chemical exchange rates in eastern nearshore zone. Ministry and municipal evaluation of potential impact of existing and proposed discharges, construction works, accidental spills, etc.

PROJECT TITLE: PORT HOPE - GANARASKA RIVER

Background: In late 1979, a methylene chloride spill reached the Ganaraska River, resulting in an extensive fish kill. Detectable concentrations were also found in waters of the filtration plant, the two intakes of which are located approximately 0.5 km west of the Port Hope harbour mouth. A plume tracking study was conducted in the fall of 1980 to assess the extent and impact of the Ganaraska River and Port Hope Harbour discharge on the water intakes. Preliminary data indicated that, under the prevailing conditions of low river flow and, westerly wind and current direction, there is no impact of the surface plume on the water intakes.

Objectives: To determine the extent of the Ganaraska River - Port Hope harbour discharge plume under different conditions.

Scope: A plume tracking study is planned for the early spring of 1981, when the Ganaraska river flow is high.

Output: Ministry reports forwarded to MOE Regional staff.

PROJECT TITLE: BAY OF QUINTE

Background: Most water uses in the Bay of Quinte have been adversely affected by nutrient enrichment. There have been occasions where little or no dissolved oxygen was present in the deep waters of the Bay, and treatment of raw water for drinking water supplies has been complicated by high densities of algae at Picton and Belleville. A number of steps have been taken to improve municipal treatment facilities. Trenton and Picton have completed plant expansions, Belleville is planning to expand facilities in the near future, and an expansion at Napanee is under construction. Phosphorus removal is now on line at all municipal plants. Significant reductions in phosphorus concentrations and algal densities in 1978 and 1979 suggest a response to these abatement measures. Earlier problems of bacterial contamination in recreational areas have also responded favourably to upgraded municipal treatment.

Objectives: Monitor the changes in water chemistry and phytoplankton in the Bay of Quinte in response to phosphorus reductions.

Assess progress in correcting bacteriological conditions.

Scope: This is a co-operative study with Canada D.F.E., Ministry of Natural Resources and the Universities of Guelph and Queen's. Virtually all aspects of Bay of Quinte limnology and fisheries are under investigation.

The scope of this study has been reduced this year as phosphorus removal is on line at all municipal plants. In-depth investigations set up to document pre-phosphorus removal conditions are now completed.

Output: Annual reports are published, incorporating material from all study team members.

PROJECT TITLE: ST. LAWRENCE RIVER - CORNWALL-MASSENA

Background: A 1979 Ministry study revealed significant persistent trace contaminant problems on the Canadian and U.S. sides of this section of the St. Lawrence River. Present data indicate contamination of sediments by PCBs and certain heavy metals and elevated concentrations of some of these pollutants in some samples of river and tributary waters as well as some industrial effluents. The magnitude of Cornwall industrial and municipal discharges to the St. Lawrence River was also assessed during this study.

Ministry studies of the proposed Cornwall STP expansion and the existing sewer system have revealed significant overflow problems to the St. Lawrence River, resulting in bacterial contamination along the city waterfront and downstream. Surveys conducted during 1980 by the Ministry under different seasonal and overflow conditions indicated that the problem of bacteriological contamination is highly variable and is attributable not only to the existing STP-sewer system but also to an industrial discharge. Phenol concentrations in the river also exceeded the objective in this section of the river during some of the surveys.

Objectives: To document existing sources of trace contaminants and bacteria and their impact on the aquatic environment and water uses in the Cornwall area.

Scope: Several water quality cruises will be conducted along the St. Lawrence River shoreline at Cornwall and at the mouths of major tributaries on the U.S. side. This is a joint study with MOE Southeast Region and the local Health Unit, and will be carried out in conjunction with the MOE young-of-the-year fish sampling program.

Output: Ministry reports will be forwarded to MOE Regional staff as input to remedial measures planning and to Canada DFE and New York DEC staff.

BASIN WIDE STUDIES

PROJECT TITLE: INTERLAKE MASS BALANCE

Background: The international surveillance plans for lakes Erie and Huron under GLISP call for annual estimates of phosphorus mass balance under Annex 3 of the 1978 Agreement.

Previous work at the headwaters of the St. Clair River indicated that frequent monitoring is required for accurate loading estimates due to the temporal variation of water quality resulting from spring runoff, seasonal phytoplankton dynamics and physical lake processes.

This is an ongoing program which began in 1979 on the Headwaters of the St. Clair River and in 1980 the St. Marys River. The headwaters of the Niagara River is being added this year.

Objective: To provide an estimate of phosphorus and other nutrient inflow/outflow loading relationships for lakes Erie and Huron.

Scope: Under contract(s) the head ranges of the St. Marys, St. Clair and Niagara rivers will be sampled once a week throughout the ice-free period of the year. Samples will be analyzed for phosphorus, nitrogens and conservative substances by the Ministry.

Output: Annual loading estimates will be forwarded to Surveillance Work Group for inclusion in the bi-annual report to the International Joint Commission.

PROJECT TITLE: RADIOACTIVITY MONITORING

Background: There are six known locations in the Ontario coastal zone of the Great Lakes where radioactive releases exist or potentially exist. These areas by type of processing include:

Uranium Mining - Serpent Harbour, North Channel

Uranium Refining - Port Hope, Lake Ontario

Waste Disposal - Port Granby, Lake Ontario (ENL Dump),
- Wellcome, Lake Ontario (ENL Dump).

Heavy Water Reactor - Bruce Nuclear Power Development (BNPD), Lake Huron.
- Pickering 'A' G.S. - Lake Ontario

A radioactivity surveillance component is defined in each of the Lake surveillance plans under GLISP which is related to the specific objective for radioactivity in the 1978 Agreement.

In addition to source control monitoring, the Province maintains an ongoing independent (non COA) monitoring program at municipal water supplies in the Great Lakes. Composite raw water samples at either weekly or monthly intervals are taken continuously for analysis of specific radionuclides. The municipalities include:

Lake Huron: Port Elgin
Kincardine

Lake Erie: Amherstburg
Harrow-Colchester
Union (Blenheim)
Wheatley

Lake Ontario: Niagara-on-the-Lake
Toronto
Pickering
Ajax
Whitby
Port Hope

This program has been underway for several years and to date no exceedence of Federal drinking water guidelines has been noted.

- Objectives: To provide surveillance information on specific radionuclides for the source control area (SCA) component of the International Radioactivity Surveillance Plan for those areas of potential or existing radioactive releases to the Ontario coastal zone of the Great Lakes.
- Scope: Radioactivity surveillance of source control areas in the Great Lakes is an ongoing program. Laboratory support for the IJC program is provided by the Ontario Ministry of Labour.
- Output: Radioactivity surveillance data is compiled and reported annually.

PROJECT TITLE: BASELINE ASSESSMENT OF TRACE CONTAMINANTS IN THE GREAT LAKES WETLANDS/ESTUARIES

Background: A recent study of trace contaminant residues in the sediments of Inner Long Point Bay under Lake Erie GLISP indicated that enclosed estuaries can act as repositories of contaminated sediments.

Wetlands/estuaries in the coastal zone of the Great Lakes are critical components to the health of the Great Lakes ecosystem since they are habitat for critical life stages of important sport fish species and wildlife. The presence of stresses such as contaminants may pose a long-term effect on the stability of such systems and as such the fate and transport of contaminants in these areas must be understood and monitored.

Objectives: To assess the fate and transport of contaminants in two estuaries.

Scope: Based on study findings and experience from the Inner Bay Study, sediments will be sampled in Rondeau Bay (Lake Erie) and Matchedash Bay (Georgian Bay). Sampling will be based on a finite element grid to allow for the calculation of quantitative mass balances of contaminant residues in sediment. As in the Inner Bay Study, this information will form the basis from which further in depth investigations of ecosystem stresses will be undertaken as necessitated. Replicate core samples will be partitioned over several intervals for analysis of organochlorine and organophosphate contaminants, particle size, bulk density and heavy metals.

Output: Project reports by site.

PROJECT TITLE: CONTAMINANTS IN SPORT FISH

Background: Since the late 1960's the Ontario Government has been monitoring fish from Ontario watercourses.

In July 1977, the Ontario Government compiled and published comprehensive information on lakes monitored since the program began.

Fish collections are continuing and data on fish species from many lakes are available in reports entitled "Guide to Eating Ontario Sport Fish".

Objectives: Maintain surveillance of known contaminant levels and identify sources of contaminants inputs by utilizing resident fish species.

Scope: Fish collection and testing is a joint program of the Ministries of Environment and Natural Resources. Fish will be collected from sites along the Ontario shoreline of the Great Lakes. Whenever possible the collection includes 15 to 30 fish of each species representative of the size range from the lake being tested. Length, weight and sex are recorded.

Output: Environmental Health Bulletins are issued on a monthly basis. "Guide to Eating Ontario Sport Fish" is updated annually.

PROJECT TITLE: CONTAMINANTS IN YOUNG-OF-THE-YEAR FISH

Background: The presence and persistence of unacceptable contaminant concentrations in Great Lakes fish is well documented and has led to restrictions in domestic fish consumption and the implementation of restrictions on the use of certain industrial and agricultural compounds.

Use restrictions have led to significant contaminant residue reductions in juvenile nearshore spottail shiners. Continued fish residue monitoring is needed to establish reliable contaminant trend data for predictive purposes.

Objectives: To monitor persistent contaminant concentrations in nearshore young-of-the-year spottail shiners at selected sites in the Great Lakes for:

- a) contaminant trend evaluations
- b) problem area identification for point source investigations.

To evaluate sources of contaminants from municipal sewage treatment plants and industrial discharges.

Scope: Thirty-seven collection sites have been sampled on the Great Lakes. Annual collections of young-of-the-year spottail shiners will be continued at most of the sites identified for metals and organochlorine contaminant analyses.

Fish toxicity and fish tissue contaminant levels will be monitored at selected industrial discharges to the Great Lakes.

Output: Annual report will be prepared for the IJC through the Surveillance Workgroup.

PROJECT TITLE: WATER INTAKES

Background: Phytoplankton analyses have been performed on raw water samples at several municipal water supplies for 15 years. Since the establishment of this ongoing program in 1976, weekly samples have been collected at eleven locations to monitor nearshore water quality for nutrient and mineral parameters and phytoplankton. In 1979, three locations were added and in 1980 one additional location was added. Two more locations were included in January 1981 for a total of 17 locations. The use of municipal water intakes as a sampling source permits frequent and year-round collection from a fixed source without interference of weather and at a very reasonable cost.

The current emphasis of this program is on the assessment of improvements in water quality that have resulted from the phosphorus removal programs implemented in Ontario during the 1970s.

Objectives: To measure seasonal and year-to-year changes in phytoplankton and water chemistry in nearshore areas of the Great Lakes.

To monitor long-term trends (ten years or more) related to changes in Great Lakes Water Quality.

Scope: Samples of raw water are collected weekly from municipal intakes at the following locations:

- Lake Superior - Thunder Bay, Terrace Bay
- Lake Huron - Goderich, Lake Huron W.S.S. (Grand Bend), Lambton A.W.S.S. (Sarnia)
- Detroit River - Amherstburg
- Lake Erie - western basin-Union W.S.S. (Kingsville)
- central basin - Blenheim, Elgin (St. Thomas)
- eastern basin - Dunnville, Bertie Township*
- *no phytoplankton analyses
- Lake Ontario - Grimsby (Jan. 1981)
- South Peel (Lakeview Plant), Metro Toronto (R.L. Clark plant),
- Cobourg (Jan. 1981), Kingston
- St. Lawrence River - Brockville

Chemical analyses (11) parameters) include:

Total Phosphorus, soluble (filtered) reactive Phosphorus, Ammonia-Nitrogen, Total Kjeldahl-Nitrogen, Nitrate-Nitrogen, Nitrite-Nitrogen, Chloride, Silica (unfiltered reactive Silicate), Conductivity, Chlorophyll a, Chlorophyll b

Output: Annual report summarizing data collected from all locations is provided to Surveillance Workgroup for inclusion in the annual and bi-annual reports to Water Quality Board, IJC.

PROJECT TITLE: STRATIFIED TRIBUTARY MONITORING

Background: Tributary loading information is an essential component for mass balance calculations as well as providing input for modelling the phosphorus remedial measures program in the Great Lakes basin. This information is provided annually to the Surveillance Work Group for update to the Water Quality Board Report.

A program began in 1979 to improve loading estimates for selected Great Lakes tributaries. This information is used in the loading allocation scheme under the 1978 Great Lakes Water Quality Agreement.

Objectives: To enhance the precision of tributary loading estimates for significant tributaries.

Scope Stratified water quality sampling techniques are employed at 15 tributary stations of "major" significance. Local contract samplers are used with technical backup from regular staff.

Samples of suspended sediment and streambed material are also collected and analyzed to inventory trace contaminants by watershed.

Information obtained will be used to further optimize the allocation of sampling in the future.

Output: Improved annual loading estimates will be calculated using a computerized multi-strata loading model with results provided annually to Surveillance Work Group.

PROJECT TITLE: INDUSTRIAL DISCHARGE ASSESSMENTS

Background: During the recent review of mixing zone designations, regional abatement and industrial representatives requested information regarding on-site verification of model estimates. One or two pulp mill locations on Lake Superior and the Allied Chemical plant at Amherstburg on the Detroit River are being considered for further field verification of dispersion predictions.

Additionally, it is anticipated that some 20-30 proposals for new or expanded treatment facilities with discharge to the Great Lakes will be submitted for review and recommendation.

Objectives: To verify mixing zone designations for existing discharges and develop same for new or expanded discharges and to recommend alterations to treatment level and/or outfall design and location, to protect against water use conflict and minimize zone size.

Scope: Field measurements of contaminant distribution, currents and thermal regime will be made at the existing discharge sites under a variety of meteorologic conditions and seasons. The data generated will be compared to the input data previously used in model predictions with further modelling undertaken as necessary.

Proposed new or expanded discharges will be evaluated using existing data on water quality and dispersion related factors derived from adjacent lake areas. These will be supported by further field measurements as required. Recommendations on effluent requirements and outfall design and location will be determined by optimization modelling.

PROJECT TITLE: MUNICIPAL DISCHARGE ASSESSMENTS

Background: The Ministry has prepared preliminary designations of mixing zones associated with existing municipal discharges to the Great Lakes. This process has successfully related water quality objectives to abatement requirements.

During the process of designating mixing zones, three sites in Lake Ontario were identified as requiring additional information on the possibility and probabilities of water use conflicts. These are: Bowmanville, York-Durham and Lakeview.

Additionally, it is anticipated that some 20-30 proposals for new or expanded treatment facilities with discharge to the Great Lakes will be submitted for review and recommendation.

Objective: To verify mixing zone designations for existing discharges and develop same for new or expanded discharges and to recommend alterations to treatment level and/or outfall design and location, to protect against water use conflict and minimize zone size.

Scope: Field measurements of contaminant distribution, currents and thermal regime will be made at the existing discharge sites under a variety of meteorologic conditions and seasons. The data generated will be compared to the input data previously used in model predictions and further modelling undertaken as necessary.

Proposed new or expanded discharges will be evaluated using existing data on water quality and dispersion related factors derived from adjacent lake areas. These will be supported by further field measurements as required. Recommendations on effluent requirements and outfall design and location will be determined by optimization modelling.

SUPPORT ACTIVITIES

PROJECT TITLE: DATA MANAGEMENT

Background: Data management is a fundamental component of the Great Lakes Surveillance program. This project relates to those collective activities involved in the systematic editing, storage, retrieval, updating and cataloguing of data collected under MOE's component of the International Great Lakes Surveillance Plans. This includes storage on both non-electronic and electronic storage systems. The bulk of MOE's historical Great Lakes water quality data (currently estimated greater than 190 million characters) is stored in the storage and retrieval system known as the Sample Information System (SIS). COM - Computer Output Microfiche is the preferred media for information exchange to external users with tape and paper copy optional.

Objectives: To provide fiscal and resource support for the maintenance, quality control, update and operation of the Great Lakes component of the Sample Information System.

To provide data and information retrieval services to support reporting as well as the information requirements of a wide client base including members of the International Great Lakes Water Quality Surveillance Community.

Scope: The Laboratory Information System (LIS) at the MOE Main Laboratory is now operational. The LIS streamlines the flow of field and laboratory data using a computer to control laboratory information. With the LIS, greater attention will be focused on quality control and editing of both current and historical data on the SIS.

Output: Information retrieval services, including formatted computer tapes, parameter and station summaries and COM.

PROJECT TITLE: DATA ANALYSIS

Background: Computerized data analysis is a fundamental operational component in the reporting of water quality information. This activity can be grouped into two general categories including production data analysis using proven analytical methods and software; and developmental data analysis including the development and testing of new techniques and software. This component is designed to ensure timely and cost-effective reporting of data collected under the International Great Lakes Surveillance Plans.

A new digital plotter was acquired during 1980 to improve the quality and throughput of line graphics support for data analysis.

The Water Resources Branch, has recently completed a feasibility study on Distributed Data Processing which is currently under review. If approved, the installation of new hardware will significantly improve the data analysis capability of the Branch and the Great Lakes program.

Objectives: To provide fiscal support for computer time, software (development, maintenance, and purchase) and enhancements to computer input/output hardware as required for data analysis support for reporting.

To provide technical support for data analysis including statistics, modelling, computer mapping and graphics.

Scope: A wide variety of tasks are included in this project including:

- (1) Production data analysis using operational software tools such as 2 WAY-ANOVA, SYMAP, SPSS, TEKTRONIX (TCS and AG II), LUZ Model Library and ASPEX.
- (2) Development, testing and implementation of new statistical, graphical and numerical analysis techniques.
- (3) On demand case applications programming.
- (4) Aquisition and maintenance of computer hardware.
- (5) Maintenance, modification, optimization and documentation of existing data analysis software.
- (6) Participation in technical meetings and reporting related to data analysis.

Output: Tabular and graphic input to a variety of MOE reports on water quality; software documentation; seminars; and technical reports.

PROJECT TITLE: REQUESTS FOR INFORMATION

Background: The need for information on the suitability of Great Lakes waters for municipal and industrial water supply, recreation and fishing etc., and growing concern for pollution problems has resulted in an extraordinary number of request for data, information and advice. Requests come from the public, industry, consultants and other government departments.

Objectives: To meet the information needs of the requestor in an efficient and timely manner.

Scope: It is anticipated that some 300 + requests will be received in 1980/81 and that these will be dealt with using existing data and information.

PROJECT TITLE: I.J.C. SUPPORT

Background: The Canada/Ontario Agreement commits the Ministry to providing continuing scientific and technical staff support to the International Joint Commission, its advisory boards and committees.

Objectives: To fulfill commitments made under C.O.A.

Scope: Ministry staff employed in the Great Lakes Program will sit on, and/or provide scientific, technical, secretarial and clerical support to, the following:

- Water Quality Board
- Science Advisory Board
- Surveillance Work Group
- Data Interpretation and Management Work Group

Output: Preparation of International Surveillance Plans
WQB bi-annual Report and special assignments requested by the I.J.C. or its boards.

PROVINCIAL
SUMMARY OF RESOURCES
1981/82

ESTIMATED*
1981-82 MOE GREAT LAKES PROGRAM BUDGET

	<u>\$000's</u>
Salaries	
Classified	\$1,317.0
Unclassified	\$ 154.0
Employee Benefits	\$ 202.0
Services	\$ 561.0
Supplies & Equipment	<u>\$ 257.0</u>
TOTAL 81/82	<u><u>\$2,491.0</u></u>

CONTRIBUTING MOE ACTIVITIES AND BUDGET

	<u>\$000's</u>
<u>Water Resources Branch</u>	
- Great Lakes Section	
Scientific Operations	1,161.0
Marine Operations	333.0
Management	118.0
- Hydrology & Monitoring Section	25.0
- Quality Protection Section	70.0
- Limnology Section	161.0
- Administrative and Data	
Services Section	63.0
- Cartography & Drafting Section	<u>19.0</u>
Total:	<u>\$1,950.0</u>
<u>Laboratory Services Branch</u>	
- Microbiology Section	97.0
- Organic Trace Contaminants Section	54.0
- Inorganic Trace Contaminants Section	120.0
- Water Quality Section	165.0
- Pesticides Section	<u>105.0</u>
Total:	<u>\$ 541.0</u>
Total Activities	<u><u>\$2,491.0</u></u>

* Actual expenditures not yet available

CAT. No. 23-115



DATE	ISSUED TO

